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The Farmer's Digest

Volume 4 February, 1941 Number 10

Taking the Road Back to Soil Fertility

Condensed from Better Crops With Plant Food

Kenneth S. Davis

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THIS is the story of the Big Creek watershed—155,000 acres of land in northern Missouri and southern Iowa, typical of some 11,000,000 acres that make up one of the Midwest's major "erosion problem areas." This is the story of the land, of the people who live on it, of what they did to it, and of what they are now doing to restore it.

We can begin with the Teale farm, 240 acres of rolling land 5 miles northwest of Lamoni, Iowa. The farm was first purchased from the Government in 1853, soon after the first white settlers came into the Big Creek area. The Teale family bought it in 1880 and moved on it the following year.

It was a good farm, rich in black, crop-growing topsoil. It yielded abundant harvests which spelled prosperity for the new owners. Additions to the small house which originally stood on the farm resulted, finally, in one of the finest farmsteads in the community. And when the family sold the farm in 1900 at a very handsome profit, it was apparently as good as ever. There were no gullies on it. In fact there were few gullies in the entire community, according to H. B. Teale, whose father bought the place in 1880.

When H. B. Teale, who is now a businessman in Lamoni, visited his old home in 1934, he could hardly recognize the place. Gullies gashed the formerly smooth, rolling fields. Sheet washing had stripped most or all of the topsoil from many slopes. The farm would no longer support a farm family at a decent standard of living without the expenditure of more money for "land treatments" than most farmers could afford. And this damage had been done in 30 years!

That was the fact which impressed Teale. In a generation or less a good farm had been lost to erosion, had bled its substance

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Washington, D. C.

down the creeks and rivers with every heavy rain, until it had become a caricature of its former being—emaciated, scarred, sterile.

"Force Farming" Destructive

The man who bought the farm from the Teales in 1900 sold it in 1917. That was the year that a new farming slogan swept the land: "Food Will Win the War." The new owner, from motives of both patriotism and profit, started "force farming." He plowed up every available acre, planted it to cash crops (corn and small grain), and kept on planting those crops year after year in an effort to beat the economic depression which set in as soon as the artificial war market collapsed. Crops used up the life-giving humus in the soil, and little or no effort was made to balance fertility outgo with fertilizer applications or legume hay crops. More important, the soil became steadily less receptive to rain, more and more water ran off, carrying soil with it, and growing gullies cut bare fields into narrow ribbons of infertile soil.

In 1932, the Federal Land Bank was forced to foreclose on the mortgage it held on the place, and the farm was abandoned to make a tragic ending to the story of land misuse. The bank has now repaired the old house, repainted it, made it respectable again, but rebuilding land is a slower and more difficult process. It takes Nature from 400 to several thousand years to build a single inch of topsoil under blankets of grass or trees. Erosion processes, at work on open, unprotected slopes, can remove that much soil during a single heavy rain.

Unfortunately, the Teale farm is no isolated example of land decline. There are other examples—too many others. For 80 years, the dominant soil trend in the Big Creek area, as in most other areas in the Midwest, was from rich to poor. The first settlers found the area covered with prairie grasses, a rolling sea of grass broken here and there by patches of timber thrust up along streams and in rough areas. They found a layer of topsoil, 12 to 16 inches thick, rich with the fertility accumulated during thousands of years of plant life and decay. When they sliced through the prairie with their "sod-busting" plows and planted crops, they reaped harvests of corn averaging 50 bushels per acre and sometimes going to 100 bushels, harvests of oats and rye varying from 25 to 40 bushels, despite their use of seed strains which, by modern standards, were definitely inferior.

But for the most part, the early settlers engaged in livestock farming. Grain farming gradually increased in importance as the prosperous years passed, but not until the World War did it assume major importance.

The World War marked a turning point. Indirectly, through its stimulation of the market, the war speeded up and brought out into the open a destructive process which had been at work on most of the cultivated fields since the prairies were first plowed. The shift from livestock to grain farming was abrupt. Thousands of acres of land, formerly protected by grass and used as pasture, were plowed up and planted to cash crops—corn, wheat, oats. A convenient marriage of profit and patriotism gave issue to an orgy of soil exploitation for which Big Creek farmers have been paying ever since. Soil erosion, formerly a sneak thief stealing soil slyly, became a bold thief, stripping off layers of surface soil and gouging out gullies with no effort at secrecy.

This process continued long after the war was ended. During the boom years, many farmers mortgaged their farms to buy more land, more equipment, new buildings. When the war market collapsed in the early 20's, these farmers were forced by the debt load they carried to continue turning soil fertility into cash, with little regard for the needs of the land itself. Gullies grew and crop yields declined.

By 1934, when a detailed soils survey was made in the Big Creek area, the depth of topsoil had declined from an original average of more than 12 inches to an average of from 4 to 6 inches. From one-fourth of the watershed area, or more than 35,000 acres, 75 per cent or more of the original topsoil had been washed away; hundreds of acres of subsoil were exposed.

Thus spots of barren earth had developed and were slowly spreading, like the blight of a disease, over the landscape. At the violent hands of man, thousands of acres had sickened and died.

But 1934 marked another turning point. In the fall of 1933, the Federal Government co-operated with the University of Missouri in the establishment of a soil conservation "demonstration" project in the Big Creek watershed, with headquarters at Bethany, Missouri, the second of the 176 projects to be established in the United States and Puerto Rico. A staff of trained soils technicians, engineers, agronomists, foresters, and farm-management specialists moved in to help farmers battle the erosion menace. By the spring of 1934, the project was well under way.

Purpose of the work was to show farmers how to conserve soil by actually having representative farmers do it on representative farms. Thus the project was designed to serve, not merely the farmers in the Big Creek area, but also all other farmers facing similar erosion problems.

To that end, every farmer in the 155,000-acre area was given

an opportunity to enter into a "cooperative agreement" with the U. S. Soil Conservation Service (then known as the Soil Erosion Service), whereby the farmer agreed to follow a recommended soil conservation plan, made out by the farmer himself with the help of a soil conservation technician, for a minimum period of 5 years. The Service agreed to provide the farmer with technical and a certain amount of material assistance in carrying out the planned program. Of the 1,042 farmers in the area, 818—operating 117,000 acres—became "cooperators."

In framing the farm plan, technicians and farmers made use of data obtained through the soils survey which has already been mentioned. Soils men went over each farm, equipped with soil augers, air maps, surveyors' instruments, and mapping tables. On the air maps were recorded data as to soil type, degree of erosion, steepness of slope, and present land use; data which, when combined with information concerning the individual farmer's financial condition and farming preferences, provided a firm factual basis for erosion-control planning.

As for the plan itself, it called for a "complete" or "coordinated" program, covering every acre of each farm and making use of whatever soil-saving practices or combinations of practices are needed to do the conservation job. This type of demonstration is a new departure in the field of agricultural "education by example." State and Federal farm agencies have long made use of the demonstration teaching method, but heretofore demonstrations have generally been of single practices—pasture renovation on one farm, fertilizer applications on another, terraces on another, and so on. In Soil Conservation Service demonstrations, the different practices are tied together in a single program having a single objective: soil use without waste.

The 160-acre Oscar Anderson farm, a few miles southwest of Lamoni, Iowa, provides a typical example of the way in which the program is applied. The Anderson farm is, for the most part, "on the slant." Soils men in their own peculiar lingo classify the topography as "rolling to broken." There's scarcely a flat acre on the place, and the average slope of the fields is between 6 and 10 per cent (that is, the average field has a fall of from 6 to 10 feet for each 100 feet on the horizontal). Principal soil type on the farm, as in the Big Creek project as a whole, is Shelby silt loam, a fertile but highly erodible soil.

Back in 1934, when Anderson started his soil-saving program, he was faced with a serious erosion problem. From most of the

fields, between one-fourth and three-fourths of the original topsoil had already been washed away. From portions of the farm all of the topsoil was gone, and the land was no longer profitable to farm. For years, Anderson had been fighting a losing battle with field ditches.

Root of the trouble, as Anderson now freely admits, was the use he had been making of his land. In 1933, for example, 103 of his rolling acres were planted to corn, a crop which provides virtually no protection for the soil. Less than 30 acres were protected by pasture, and what pasture he had was severely overgrazed. Twenty acres of land lay idle. And there was not an acre of hay or timber on the farm!

Accordingly, the first step was to rearrange completely Anderson's cropping system. This involved a shift from cash crop to general livestock farming, a shift which Anderson was glad to make, because it was obvious to him that his farm's productive days were numbered unless erosion was brought under control.

The acreage in cultivated row crops was drastically cut—from 103 to 13. A 5-year rotation consisting of corn, oats, and 3 years of alfalfa, clover, and timothy hay was established for all cultivated cropland. Thus, small grain acreages were increased from zero to 12 for the average year, and rotation hay acreages increased from zero to 32. The acreage in permanent pasture was increased 2½ times—from less than 30 to approximately 77 acres. Some 8 acres of steep and severely eroded land were planted to trees for erosion control and wildlife management.

It can be seen that the revised cropping system keeps most of the "weak" acres "under wraps" most of the time, so that erosion has little chance to cut into the soil resources. Moreover, Anderson supplemented his cropping revisions with new soil-saving tillage methods. All of his cropland is now operated on the contour or level instead of in straight rows "up and down," so that now each crop row serves as a miniature dam or terrace cutting across the line of flow of run-off water, slowing it down, and thus causing more of it to soak into the ground. He built broad-based soil-saving terraces to protect 26 acres of cropland, he built diversion dikes and planted trees to heal up gullies, he limed and fertilized all of his crop and permanent hay land, and he instituted the practice of "rotational grazing" on all of his pasture land, so that over-grazing with its resulting "bare spots" would be avoided.

Result of the program is that Anderson can now use his soil profitably without using it up. He has placed his farm enterprise on a permanent basis by provid-

ing adequate safeguards for his soil assets. Erosion and run-off have been cut to a fraction of their former amounts. Studies conducted by Soil Conservation Service technicians reveal that, whereas formerly Anderson's net nitrogen loss from his soil was 5.38 per cent annually, it is now only 0.027 per cent—and soil fertility can be measured fairly accurately in terms of nitrates. Finally, the conservation program has resulted in a distinct improvement in Anderson's farm income.

The program on the Anderson farm portrays, in fairly accurate miniature, the program for the Big Creek project as a whole. The crop acreage of co-operating farmers has been cut from 59,000 to 40,000. The acreage in permanent hay has been increased to 6 times the former amount, from 2,400 to 17,000 acres. The acreage in pasture has been increased from less than 50,000 to more than 53,300. The acreage devoted to farm woodlots has been increased from 370 to 1,850.

Incidentally, farm woodlots can play a more important part in the individual farm economy than most people realize. A recent survey of 50 farms included in "cooperative agreements" in the Big Creek area revealed that the annual replacements for fences on the average farm required 45 posts having a market value of $8.40. All but 12 of the 50 farmers used wood exclusively for fuel, with each of the 38 farmers burning 16 cords of wood per year, on the average. Purchased on the open market, this amount of wood would cost the farmer $36.83. During the last 10 years, the average farmer has used about $5.50 worth of lumber each year for repairs, but this figure is low, because little repair work has been done during the "Depression Thirties." Altogether, the average farm in the area uses $52.74 worth of wood products annually. Most of these products can be produced on the farm, and, under the new conservation program, a much larger portion of them will be.

Soil-saving Practices

Important in the establishment of good soil-saving crop rotations was the application of lime on Big Creek farms. Practically all of the land in the area requires applications of 3 tons of lime per acre to overcome the soil acidity, which otherwise prevents the success of legume seedings. Some 75,000 tons of lime have been crushed by the Soil Conservation Service and spread over 25,000 acres of cropland in the project area. To see to it that lime and soil alike "stay put," contour or "around-the-hill" cultivation has replaced straight row tillage on most of the cultivated sloping acres, and 623 miles of broad-based terraces have been

built to protect 9,400 erodible acres. Approximately 4,000 acres are protected by contour "strip cropping," whereby long slopes are planted to alternating strips of clean-tilled and close-growing cover crops, and more than 6,000 acres will be so protected when the planned program is completed on all farms.

Introduction of contour tillage on slanting fields has been the most spectacular departure from traditional farming methods in the area. The ability to plow a straight furrow has long been considered one mark of a good farmer; hence, the growing acceptance of the new criterion of good farming, namely, the ability to plow a furrow which deviates less than 2 per cent from the "true" contour, is something of a psychological triumph for co-operating farmers and soil conservation technicians.

The demonstration farms prove conclusively that contour tillage saves soil and moisture. Every farmer who has tried "around-the-hill" cultivation has noted that erosion losses from his fields after heavy rains are small indeed compared to the soil losses from neighboring fields operated in the usual way. Moreover, many farmers have reported substantial increases in yields on newly contoured fields—increases which they attribute to improved soil moisture conditions.

It might be expected that the immediate result of the drastic revision in Big Creek farming methods would be a marked reduction in farm incomes, however beneficial the programs might be in the long run. This, however, has not occurred. Farm incomes have not declined. Indeed, they have increased, though credit for the increase cannot be given altogether to the conservation work.

The net income for the average co-operating farmer, as revealed through some 60 individual farm record books kept by farmers in cooperation with the University of Missouri, was $845 in 1935, $649 in 1936, $882 in 1937, and $1,199 in 1938. B. H. Frame, of the Department of Agricultural Economics at the University of Missouri, points out that this fluctuation in income is no greater than might normally be expected, and hence has little significance, except that it does indicate that establishment of conservation programs has worked no economic hardship on the farmers.

More significant is a comparison made between incomes from the "one-third farms with least erosion" and the "one-third farms with most erosion." The comparison, made in 1938 and based on farm account records, revealed that between 1935 and 1938, inclusive, the average management return (distinguished from labor income" and "interest on invest-

ment") was $107 from the one-third farms with least erosion as compared with $4.50 for the one-third farms with most erosion. In 1938, the gross value of all crops was $5.90 per acre for the average farm in the low erosion group, as compared with a value of $4.12 per acre for the average farm in the high erosion group.

From Grain to Livestock

Still more significant, from the long-time point of view, is the basic shift from grain to livestock farming in the Big Creek area. The manager of the Lamoni Co-operative Creamery at Lamoni, Iowa, has reported that the volume of cream obtained on cream routes lying inside the project area has increased 50 per cent over the volume obtained on routes outside the area. The creamery manager explained that in his opinion the increase in pasture-carrying capacities and the increased use of legume hay, both of which result from the conservation programs, are responsible for the increased production of cream. The manager also reported that, during periods of seasonal decline, the volume of cream declined 25 per cent more on routes outside the project area than on routes inside.

The farmers look forward confidently to a definite increase in farm productivity rather than a gradual decline. They know that now, for the first time on many farms, their agricultural enterprise is on firm footing. Their basic capital is not slipping out from under their feet with every heavy rain; they've placed their soil under lock and key.

The hundreds of people who visit the Big Creek area each year find in the demonstration a "window" through which they can glimpse the farm patterns of the future. They are given a preview of the farming practices which, in the not too distant future, must blanket millions of acres of erodible land in America, if a prosperous agriculture is to continue. They see curved rows bent gracefully around the slopes, terraces tying down wandering soil, greens replacing browns on thousands of acres where hay and grass have replaced small grain and corn.

More than 5,000 people, most of them farmers from Missouri and Iowa, have visited the demonstration since 1934. Many of them have returned to their own farms to apply the practices they have seen demonstrated. Thus the project has become a focal point for a spread of conservation farming methods.

Moral of the Big Creek story is that farmers on erodible land must adapt their farming patterns to the needs of the land—or else. The "or else" has been clearly indicated on the Soil Conservation Experiment Station, maintained at Bethany by the U. S. Soil Conservation Service and the

University of Missouri. The station, started in 1931, has had a great deal of influence on the program established, not only in the Big Creek area, but in scores of other areas throughout the country.

Plot studies there have shown that, by planting corn year after year in straight rows up and down an 8 per cent slope, farmers can gave away to erosion the top 7 inches in just 15 years. Since the average depth of top-soil is considerably less than 7 inches in the Big Creek area, the "or else" part of the moral is obvious. Plant that same slope to a 3-year rotation of corn, wheat, and timothy and clover, and you increase the longevity of its top-soil to 114 years. But keep the slope in blu grass or permanent legume hay and you increase its longevity to around 5,000 years, which means that you'll be giving nature a chance to build soil faster than erosion can wash it away!

Outwit Beaver Dam Builders

BEAVERS, as original soil and water conservationists, are so highly capable that the conservation specialists often recommend stocking a stream with beavers trapped elsewhere as an economical and effective method of insuring all-season flow in streams that would otherwise be in flood at times and dry most of the year. But the aims of the beaver dam builders do not always agree with the ideas of the conservation engineers, who, may, for example, want to avoid the danger of flooding valuable meadows along a stream with water backed up by a beaver dam.

In such a case, if beavers persist in building a dam too high, they can be circumvented, Soil Conservation Service engineers have found, by putting six-inch iron pipes through the dam at the desired water level. To prevent the beavers from damming the pipes, too, they should protrude at least 6 feet upstream and downstream from the dam. And to prevent the beavers from plugging the pipes, it may be necessary to cover the upstream ends with heavy rocks.

—*U. S. Dept. of Agriculture*

Latest Facts on Protein Supplements

Condensed from Southern Agriculturist

H. R. Duncan

Associate Professor of Animal Husbandry, University of Tennessee

PRICES of feeds, feeding practices, and ideas about feeds change as well as world-wide political and economic conditions. There have been recent radical changes in the production and price of available protein supplements. New information on these feeds is also being developed.

The information given in the table below on the four most commonly used protein supplements is for comparable grades. Shelled corn is shown for contrast and comparison. These supplements are produced in many grades. They will vary in protein content from 30 to 50 per cent, and the price will vary somewhat with the amount of protein. These protein supplements may be used in two ways. (1) As a source of protein. A pound of protein in each of these feeds has about the same value for practical feeding purposes and the price per pound of the protein is, therefore, the principal consideration. (2) These feeds are also used as a source of total digestible nutrients (protein, carbohydrates and fats) just like corn for fattening or milk production purposes. When used in this way, 100 pounds of cottonseed or other supplement is worth 87 to 95 per cent as much as corn. Very often, more of these feeds are used than is necessary to balance the rations, and when so used they are not quite as valuable, pound for pound, as corn. There are times when feed prices justify the substitution of considerable amounts of these supplements for corn.

Analysis and Prices

Feed	Grade	Digestible protein	Total digestible nutrients	Knoxville price per ton	Cost per lb. of protein	Cost per lb. of total digestible nutrients
Cottonseed oil meal	41%	33.9	73.6	$28.35	4.16c	1.93c
Soy bean oil meal	Below 43%	34.8	80.5	27.50	3.99c	1.71c
Peanut oil meal	36-43%	35.9	81.8	25.50	3.55c	1.56c
Linseed oil meal	37%	33.5	77.8	35.00	5.22c	2.25c
Shelled corn	No. 2	7.1	80.6	26.75 (75c bu.)	19.00c	1.66c

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These protein supplements are all lacking in vitamins A and D, which are very essential for proper growth and good health in animals. Green grass and sun-cured legume hays supply these vitamins in liberal amounts and would, therefore, correct any vitamin deficiency due to their use. These supplements are good sources of phosphorus, but are low in calcium.

Cottonseed meal will not poison cattle or "burn them out" when fed in large amounts, provided it is fed with feeds which supply vitamins A and D. Former cases of poisoning were due to the absence of these vitamins rather than to the presence of any poisonous ingredient in the cottonseed meal. Cattle fed on a ration of hulls and cottonseed meal often went blind, staggered and, in extreme cases, died. This condition can be corrected by feeding silage or good sun-cured hay. At the Oklahoma Experiment Station dairy heifers were grown out from calfhood and carried through three gestation and lactation periods on a ration of prairie hay and cottonseed meal. During the lactation periods, some of these cows ate an average of 10.3 pounds of cottonseed meal daily. There were no deaths or disorders attributable to the feeding of large amounts of cottonseed meal.

Cottonseed meal is poisonous to hogs when forming more than 10 per cent of the ration. It is safe to feed a protein supplement made by mixing 50 pounds of cottonseed meal with 50 pounds of tankage to hogs having all the corn and pasture they will eat.

Soy bean oil meal will not produce soft pork when used as a protein supplement. In making this product from beans, most of the oil is extracted. This supplement is excellent for hogs and should be used more generally. It is safer, cheaper and more efficient for hogs than cottonseed meal.

Linseed oil meal gives somewhat better finish than the other three supplements and has, therefore, a greater value. Unless this slight difference in finish is rewarded at the market, the advantage is lost. Where grass, silage and legume hays are used, linseed oil meal is not needed for its extra claims of palatability, finish, laxativeness and healthfulness. In the South, this feed is generally too expensive.

Cottonseed meal is not constipative, as is generally believed, when combined with such feeds as grass, silage, legume hay or corn.

How to Feed Supplements

Feed sufficient protein to balance all rations fed farm animals. It saves feed. When enough cottonseed meal is used to balance a ration for fattening calves, 100 pounds of cottonseed meal will

save 250 to 300 pounds of corn, and will increase the gains materially. Performance of all classes of livestock is improved by adding protein supplements. The lack of sufficient supplements constitutes one of the big leaks in farm income.

Exhaust the possibilities of home grown feeds before buying supplements. Good, leafy, well-cured legume hay, or good grass, will furnish all the protein necessary for several classes of livestock. Use as much good hay and pasture as possible and then buy sufficient protein supplement to finish the job of balancing the rations.

How Did Sheep Know?

LIMED pasture is better than unlimed, but how did Homer Royer's sheep know it? Royer bought a 20-acre strip of land in Columbiana county, Ohio. It was fenced into two 10-acre fields, both in bluegrass. Royer limed one. The next year he opened the gate between the two fields and turned in sheep to graze both. They ate the grass on the limed field down until it looked as bare as new plowing, and let the grass grow 6 to 12 inches high in the other.

The sheep were demonstrating a fact that some farmers have long known, but it has had little scientific attention until late years. The fact: Feed that grows on land that contains all the fertility elements, including calcium, is better feed than that which grows on poor, sour land. Undoubtedly the grass that was high in calcium tasted better. Perhaps taste and smell are the senses with which a sheep is endowed to help him determine which is best for him.

—*Capper's Farmer*

Cotton Enters the Building Trade

Condensed from Nation's Business

Gene Holcomb

THE belief that industry can use a greatly increased amount of cotton without using less of something else may smack more of wishful thinking than of logic. But it is coming to be miraculously true.

In the construction trades, cotton is proving itself of such importance that one wonders why the new adaptations have not been in use for many years. Yet the value here is not primarily that of a low-cost substitute for accepted materials, but cotton's ability to make more satisfactory and more durable the materials long in use.

A classic example of this "improving without replacing" is a new cotton-cement roof shingle developed by J. Harris Hardy, a Mississippi cotton planter. The shingle he invented is revolutionary in many ways; but in one way it is a retroversion. It uses more cement, more sand, and more paper than most other types of cement-based roofings. In application it requires more black felt as a base and more labor.

Hardy's cotton-cement shingles are manufactured on the building site. Then the shingles are applied green, within ten or fifteen minutes after making, and are permitted to "cure" while the building is being completed.

The wet shingles are laid so closely together and so snugly against the sheathing that they retain a 100 per cent bearing surface, making the roof almost indestructible. Not only do the nails, driven into the wet mixture, bond with the cement; but, during the curing period, the shingles also bond one with the other. A wind virtually would have to blow the house away to harm the roof.

Hardy's patents, in essence, control a method for curing thin concrete slabs. One ingredient which makes the cure possible is cotton fabric embedded in the shingle's heart. The cotton, acting as an aggregate, reenforces and holds the cement together. Multitudinous fibers absorb the water of the mix so thoroughly that but a small portion of the moisture reaches the surface during the curing period. Consequently, the shingles neither dry out nor expand so greatly that they crack.

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The Portland Cement Association gave a number of the shingles accelerated weather tests equal to 100 years of service and found them as good at the end of that time as when the tests started. An additional feature is that the shingles may be made in any color or combination of colors desired, and the surface texture may be modified to resemble any type of roof from slate to thatch.

People who should know expect public acceptance to be immediate. If their prediction is sound, then a government official's estimate that the shingle may absorb 1,000,000 bales of cotton a year does not seem excessive. The National Cotton Council of America, helping Mr. Hardy develop the shingle, has boosted its opinion of the product's prospects with each new test. Following the first commercial application of the roof at Jackson, Miss., in June, the Council concludes that the sky is the limit, especially if the process can be extended to floor and wall tiles and exterior sheathing.

But cotton-cement roofing is only the latest of a series of spectacular uses found for cotton in the building trades. In the past five years cotton has proved itself valuable in so many ways that it is now possible to build entire houses from cotton-treated materials. In 1934, the New Uses Division of the United States Department of Agriculture built a demonstration "cotton house" at Northport, N. Y. The house had a coat of cotton duck over conventional wood sheathing. Today, several hundred cotton houses are scattered over the country. Some use cotton-treated materials throughout; others have cotton-treated exterior or interior walls, ceilings, or roofs. The material remains securely in place, does not wrinkle or tear, and, being rain-and-temperature-proof, is unaffected by weather extremes.

Fire-resistant cotton duck suitable for building purposes is manufactured in weights ranging from number two to number ten, and in widths appropriate to the particular design of the house on which it is being fitted. Almost anyone handy with tools can put it on. After the backing surface chosen for the exterior walls (either tongue and groove sheathing or plywood) has been smoothly dressed, it is spread with a fine coat of lead and linseed oil paint. Next, a thin layer of bedding cement—one gallon to 150 square feet of surface—is applied to the dried paint.

While the cement is still "tacky," the duck is laid on it in strips, with the exposed edges nailed in place. The succeeding strips are overlapped 1½ inches on strips previously laid.

Once the fabric is applied, there is no hurry to get it painted.

The paint may be applied after six months or even a year. Any house paint with a lead and oil base may be used, but the best results are obtained with paint having affinity for the fire-resistant compounds within the fabric itself. If the builder does not wish to paint, he can obtain ready-dyed duck in black, brown, green, orange, khaki, dark gray, olive drab, aluminum, and terra cotta shades.

In the ease of its application to interior walls and ceilings, cotton fabric may be compared with wall paper. It can be placed directly over studs and joists, or it can be applied with an adhesive to plaster, plasterboard, and other materials. Equally satisfying is the manner in which it lends itself to decorative requirements. New design effects with cotton materials, both inside and out, open up a world of possibilities.

Also on the market is a steel wire mesh lath with cotton fabric backing. This material is designed to make plaster walls and partitions possible in the lowest cost homes. The fabric holds securely in place the barest amount of plaster and also reduces labor costs.

With cotton fabric proving so successful, it was not to be expected that its application would be confined to "on-the-job" operations. Prefabricated material—interior and exterior walls, roofs, and ceilings—is receiving an increasing response. Lawrence Ottinger, president of the U. S. Plywood Corporation, has endorsed the use of cotton fabric facing on plywood. Synthetic resins bind the fabric to the plywood as closely as if it were another ply.

It is Ottinger's company which has brought out "Flexwood," a sheet of thin veneer laminated to cotton cloth so pliable that it can be wrapped around almost any building form. Flexwood obviously has great prospects as a decorative finishing material.

Another U. S. Plywood Corporation product with remarkable properties is "Robertson Bonded Metal." This is a cotton cloth fused into steel with a zinc solder and then bonded with phenolic-resin sheets to thin wood veneer. The result is a sandwich which looks and feels like wood, but which can be handled and machined like steel: drilled, punched, stamped, mildly drawn, or even spot-welded. It is almost as fire-resistant as steel. In November, 1939, Ottinger signed a contract to finish the walls and ceiling of the lobby in the final Rockefeller center building with Robertson Bonded Metal.

The Speedwall Company of Seattle claims its "Jumbo" cotton-covered interior paneling to be better in 23 ways. Certainly the fabric-faced plywood board, cut to size at the factory, is one

of 1940's major contributions to the house of today and tomorrow.

The low thermal conductivity of cotton has made it valuable as a low-cost insulating material in the construction of both dwelling and office buildings. J. H. McDonald, Texas Commissioner of Agriculture, maintains that cotton insulation "has more merits from the standpoint of consumption than all of the new uses that have come to light in recent years." Oscar Johnston, President of the National Cotton Council and manager of America's largest cotton plantation, recently insulated his Mississippi Delta home with cotton. Manufactured in the form of quilting and composed of mixed cotton linters and low-grade cotton lint, the insulating material is the culmination of efforts to fire-proof cotton fiber. Not only does it afford protection against temperature extremes but, when used in floors, walls, and ceilings, it serves the additional purpose of sound-proofing. The quilting is fire-resistant and may be obtained in rolls from 40 to 60 yards in length, and in widths up to 90 inches. Thickness is determined only by the price the purchaser wishes to pay.

Each year the American people pay for the construction of thousands of miles of concrete-surfaced roads. Within the same short period other thousands of miles of such roads must be repaired. The immensity of these figures suggests the importance of a material that lowers construction costs and at the same time eliminates much of the necessity for future repairs.

Cotton mats, developed by the U. S. Bureau of Public Roads and the Texas State Highway Department are now being used as an important part of concrete road building. Gibb Gilchrist, former Dean of the School of Engineering of Texas A. & M., finds them to be "the most economical method known and the least damaging to a road section."

Contractors on Mississippi's $90,000,000 priority system of highways used them extensively, curing the concrete slabs satisfactorily in record time.

The principal advantages claimed for the cotton curing mats include water absorption capacity, temperature protection, and durability. The mat's ability to retain moisture makes one wetting a day sufficient for the curing process. This, of course, reduces labor costs and means economy where water is costly to obtain. In the curing process, the mats materially lessen the effects of varying air temperatures on the curing concrete. This is important. It is also important that the mats offer not only considerable protection against the concrete's freezing, but also can be used to prevent freezing of the ground before the concrete is poured. Thus, taken all in all, the

mats protect freshly poured concrete from both the frost and the sun.

The mats used for curing concrete are quilt-like strips filled with bats of cotton, the latter weighing 12 ounces per square yard and made from either low-grade cotton lint or waste cotton. The covering material is seven-ounce, 40-inch cotton osnaburg. A flap six inches wide is made along one side of each mat by sewing together the covering material without filling. Including the six-inch flap, the mats are approximately six feet three inches wide. They may be used as many as 100 times and are placed on the pavement surface as soon as possible after it is finished. Each mat is wetted thoroughly before application and kept wet until removed. The curing period requires not less than 72 hours; but after it is finished no subsequent treatment is required.

After a highway is built, another type of cotton fabric is being used to advantage in solving one of the most costly problems of maintenance. Erosion of slopes and banks, caused by the highway's diverting water from its natural flow, inflicts a double damage: it injures farm lands adjacent to the highway, and it necessitates frequent road repairs. The only satisfactory method by which this erosion may be prevented is to plant the slopes and cuts in self-perpetuating vegetation, such as shrubs, trees, or a rugged type of grass. Heretofore, this was frequently difficult because of the very erosion the engineers wished to check. The soil movement gave the vegetation no opportunity to begin its growth. Today, after numerous tests, a coarse cotton fabric is used along cuts and fills to hold the soil in place while the vegetation is taking root. The process—once the idea was actually conceived—has proved to be relatively simple. The soil is prepared for seed suitable to the climate and soil conditions, and the seed is planted. Then the fabric is laid to the slope vertically, the strips being held in place by wire pegs or stakes. If desired, the fabric may be aided by a mulch of straw, hay, or leaf mold. Some of the more affluent highway departments leave the fabric on the slope until it deteriorates. Others have the fabric taken up as soon as the vegetation becomes established and then use it again on other slopes. In either case, this new method is proving to be one of the best money-savers of all the new uses yet found for cotton.

Fortunately for the cotton farmer these new uses for cotton in the construction trade have started a happy economic cycle. The cotton, flowing from the farmer as his cash crop, enhances the efficacy of established manufactured materials, gives the home builder a cheaper and bet-

ter house, the states and counties more durable roads, and, back to the farmer again, the cash necessary for starting a much needed home and road building program of his own.

New Sweet Corns

AFTER 18 years of work, Illinois Experiment Station has brought out some high-quality, heavy-yielding sweet corn hybrids. Field corn hybrids usually have 3 or more inbreds as parents, but such crosses have not proved of value in sweet corn, and all those released are first generation crosses between 2 inbred lines. A cross known as 8 x 6 yielded approximately twice as many pounds of prime cut kernels an acre as open-pollinated Country Gentleman, the variety from which it was derived. The 2-year test made by a cannery showed a yearly average of 1,525.5 pounds for the hybrid and 836 pounds for the open-pollinated corn. A cross of the Narrow Grain Evergreen variety known as 14 x 13 has been grown commercially since 1936. It may be grown wherever open-pollinated Narrow Grain Evergreen varieties succeed. The 8 x 6 has proved especially adapted to Illinois, Indiana, Ohio, Maryland and some parts of Iowa, but has not done so well in New York, Wisconsin and Minnesota. The 14 x 13 has given a good account of itself in Iowa, Nebraska, Illinois, Indiana, Ohio, Maryland, Idaho and Pacific Coast states.

—*Capper's Farmer*

Storing Grass Silage

Condensed from New Jersey Agriculture

Harry S. Besley

Assistant Agricultural Engineer

WITH the widespread use of grass silage in the past few years, storage problems have arisen which require engineering research for solution.

Silo failures of one form or another have brought demands from farmers for assistance, and to meet the demand an investigation is under way at the New Jersey Agricultural Experiment Station—with the cooperation of the Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture—to obtain information on such storage problems as silage pressures, juice control, and protection of the silo from the action of silage acids. Harvesting methods and machinery are also receiving attention.

The expression "silo failure" as used here does not necessarily mean complete collapse of the structure. Now that leakage is somewhat more prevalent, farmers have become juice conscious and are insisting that silos be leak-proof. Thus, a silo may be said to fail not only if it bursts, but also if it leaks, deteriorates, or disintegrates.

Juice Control

The juice in grass silage presents a sort of "poly-phase" problem. In high-moisture silage it may, and frequently does, leak or drain from the silo, resulting in loss of nutrients, offensive odors, and damage to any concrete over which it flows. Its control may be approached in several ways. One is to wilt the green crop in the field until its moisture content is lowered to between 65 and 70 per cent. Reports from farmers indicate some success with this method but considerable experience is required to determine when wilting has progressed to the proper stage. Wilting is also dependent on favorable weather, and the introduction of a fair weather factor in the production of grass silage is not desirable. A second method is to add to the chopped material some dehydrated preservative such as oat hulls or citrus pulp fortified with molasses to absorb the free moisture. Two silos at this Station were filled using this type of preservative and there was no leakage even with high moisture green mate-

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rial. A third method reported as practiced by middle western farmers is to use a longer cut on the chopper when ensiling material of high moisture content. This sounds promising and will be investigated.

In some instances it may be necessary or desirable to rid a silo of free juice. Therefore, considerable thought is being given to drainage systems for silos and to preventing seepage at points other than drains. In 1939 three drains were placed in the walls just above the bottoms of two 18 ft. by 42 ft. silos. One silo was filled with 188 tons of phosphoric acid grass silage and the other with 198 tons of molasses grass silage. The average moisture content of the ensiled material in each case was 68 per cent. The drainage loss from the acid silage was 975 gallons of juice, representing 2.24 per cent by weight of the ensiled material. The drainage from the molasses silage was 3,990 gallons, representing a loss of 9 per cent. Of particular interest is the fact that all of the juice lost from the silos came through the drains. For 1940, using the same two silos, one was filled with 333 tons of phosphoric acid grass silage and the other with 318 tons of molasses grass silage, moisture content in each case being approximately 77 per cent. The leakage loss from the acid silage amounted to about 16 per cent, while the loss from the molasses silage was nearly 18 per cent of the total ensiled weight. The drains functioned but carried only part of the leakage. Most of the loss occurred around the doorway, not unexpected because of the pressure panel construction. Some leakage through the stave joints occurred up to a height of 18 feet in each silo. The failure of the drains to take all of the leakage may be partially attributed to the higher pressures which amounted to almost twice the values measured in 1939. A rock fill about 3 feet in diameter with drain in the bottom was used in one silo in 1940. Filled with 97 tons of phosphoric acid grass silage at a moisture content of 70 per cent, the seepage amounted to approximately one per cent, all coming through the drain. Other types of floor drains are to be tried and vertical wall drains may be used as a last resort.

The hoops on two silos were tightened to produce a stress in the steel of approximately 18,000 pounds per square inch so that the staves might be held together with some force even after the silos were filled. Preliminary observations indicate that prestressed hoops will limit to some extent the leakage through the vertical joints of concrete stave silos but cannot be expected to entirely control the leakage problem because of the irregular joint surface found on concrete staves.

Horizontal joint leakage was more noticeable when the vertical joint leakage was reduced. In pre-stressing hoops, considerable difficulty was encountered in holding the stress on intermediate hoops that do not cross the door opening but are held by spreaders. Faulty design, particularly on spreaders carrying more than one hoop, has been evident. One common fault has been the reduction of effective area of the spreader strap by rivet holes. Improvements that have been noted include the use of continuous heavy angles along the door opening, instead of spreaders, to which the intermediate hoops are attached. The angles are held by heavy rods across the door opening at sufficiently wide intervals so as not to interfere with the removal of silage. Welding to strengthen riveted members is also in evidence.

A silo constructed in 1940 had plastic calking placed in most of the vertical joints of the three lower courses of staves to observe its effectiveness as a joint seal. From this one test the value of the calking may be questioned, as there was a small amount of joint leakage in the bottom two stave courses with little to choose between calked and uncalked joints. In any case, its value must be very pronounced to offset the cost of materials and application.

Coatings

To seal the interior and protect the concrete stave silos, some twenty-four different coatings have been applied. The materials include asphalts, coal tars, oils, paraffin wax, rubber paints, synthetic resins, special plasters, varnish and waterproofing. Results to date have not been too promising. It has been difficult to get a lasting bond between the coating and the concrete. Tests of coatings are also underway in tile block silos where difficulty has been experienced in maintaining the mortar joint and in steel silos. More durable mortar must be found for block silos as the types now used disintegrate rapidly and leave the reinforcing exposed to the action of silage acids. This will reduce the area of steel and seriously weaken the silo if allowed to continue.

Pressures

Equipment being used to measure pressures in silage was developed by the Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture. Pressures have been measured in seven silos at the New Jersey Station and one at the Beltsville Research Center of the Department of Agriculture. Results are quite variable. Maximum values for grass silage vary from 159 pounds per square foot in a 12-foot silo, with 64 per cent moisture silage at a 25 foot head, to 1,189 pounds per square foot in an 18-foot silo, with 77 per cent moisture silage at a 40-foot head.

This range is from approximately one-half to two and one-half times the value commonly used in silo design.

The effect of preservatives on pressures was observed with two 18-foot silos simultaneously filled in 1939. In one silo 106 pounds of molasses per ton of chopped material was used for the preservative, while 20 pounds of phosphoric acid was used in the other. The pressures were about 24 per cent less in phosphoric acid silage. In 1940, using 66 pounds of molasses and 20 pounds of phosphoric acid, pressures were about 20 per cent less in the acid silage.

From the early silo tests it was decided to use 19 pounds per square foot per foot of depth as the maximum pressure likely to be met under farm conditions, and J. R. McCalmont, using this figure, prepared a reinforcing schedule which may be found in U. S. Department of Agriculture Farmers' Bulletin 1820. Later results have indicated that both moisture content of the silage and silo diameter influence the pressure. Fineness of cut may also be a factor. It may, therefore, be possible to reduce the amount of reinforcing indicated in the schedule for smaller silos, particularly those of 10 and 12 foot diameters. Until check tests are made to determine if a reduction is possible, the tables in the aforementioned bulletin should be used as a basis for determining the reinforcing needed on silos for grass silage.

Capacities

Silo capacity as well as pressure is influenced by moisture, silo size, and fineness of cut. It has been observed that with average moisture grass, taken at 65 to 72 per cent, the smaller average sizes of silos will hold about the same tonnage of grass as corn. As the moisture content is increased, the total tonnage of grass is increased. Silos filled with high moisture grass have held up to 50 per cent greater tonnage than would be expected with normal corn silage.

High Lights of the Jersey Breed

CATASTROPHE and, in strange contrast, light-hearted advertising placed the Jersey breed in newspaper headlines time after time in 1940.

The catastrophe of the German invasion of the tiny Island of Jersey came to the people in early June. This Island, the place of origin of the Jersey breed, is so small it seems but a fragment from the coast of France, and for centuries has been chiefly devoted to agriculture and the development of purebred herds of Jersey cattle which furnished breeding stock for other herds the world around. Only a few weeks before the invasion the last shipment of Island Jerseys reached New York.

Treasured because of her economical production and her beauty, the Jersey cow has long made a great contribution to the welfare of the people on the little Island and the Islanders have always honored her. For example, Sir Hugh Calveley, the Warden of Gorey Castle and the defender of the Island of Jersey from 1376 to 1393, wore over his shiny armor a white shirt embroidered with three calves instead of the lions or tigers more frequently used in coats of armor.

Royalty, too, has favored the cow of the Island. Napoleon is reported to have bought a prize Jersey bull and four cows in 1815 at a cattle show held in Scotland and for three generations the British Royal family have been breeders of Jersey cattle, Queen Victoria, Edward VII and George V. More than sixty Jerseys of the Royal herds at Sandringham and Windsor were registered with the English Jersey Cattle Society in 1934.

By strength and endurance the Jersey cow weathered the long weeks of her first sailing ship voyages from the Island of Jersey to this country nearly a century ago. Through the mined waters around her romantic Island she voyaged to the Western World on the sleek ships of 1940. And in America she has kept up with the times. She has progressed from dark, uncomfortable shelters to the contemporary air-conditioned dairy barns and amazing electric milking machines.

As widely separated from old methods of publicity is the light-hearted advertising which in 1940 made a Jersey the most talked about dairy cow in the land. This New England born cow, "Elsie," selected to personalize the pen and ink advertising symbol of a big dairy company, stepped into the spotlight of the New York World's Fair and Hollywood fame through her own versatility. She was just one of the Jerseys

which shared the barns at the Fair with cows of other breeds appearing in the "Dairy World of Tomorrow." With these producers she rode each day on the smoothly turning rotolactor to be milked while thousands of admiring spectators watched on the other side of the glass wall.

Then in a publicity stunt she was adorned with wreath and ribbon bow to try out for a solo performance on the rotolactor. Her acceptance by the general public and the practical dairymen watching her was immediate, and so great was her audience appeal that her daily life became a newspaper story. Hollywood heard, saw and signed her for an important role.

Only one generation removed from the Island of Jersey through her imported sire, You'll Do's Volunteer, she was bred at Elm Hill Farm, Brookhill, Mass., and christened and registered You'll Do Lobelia 998632 but gave up her family name and home to become "Elsie." Impartial judges selected her for the role and she had to rate almost 100 per cent on every point to meet the demand for a perfect "Elsie." Aside from her fitness for the "glamour girl" part, she is a good example of the characteristic combination of beauty and daintiness with strength, vitality and the capacity for production which has resulted in the fact that more Jerseys are owned on United States farms than any other dairy breed.

Although "Elsie" had not been exhibited in the show ring she was rated Very Good for conformation, one of the two highest ratings under The American Jersey Cattle Club sponsored program by which outstanding judges of dairy cattle classify Jersey herds. On the Island of Jersey and in the United States she has paternal brothers and sisters which have won the most coveted blue ribbons and in the first year of the New York World's Fair her sister, You'll Do Bayleaf, also bred and owned at Elm Hill and rated Excellent, highest conformation classification, was a featured "Dairy World of Tomorrow" exhibit.

"Elsie's" seeming awareness and enjoyment of the audience during her solo rotolactor performance definitely deserved the "glamour girl" title bestowed upon her, but as a practical dairy cow she is equally as good. Tested as a junior 2-year-old she yielded 525.53 pounds of butterfat in 365 days and when tested during her World's Fair career, with milkings for six months of the year's test being made on the rotolactor, she yielded 521.17 pounds butterfat, 11,489 pounds milk. Already she has yielded well over a ton of butterfat since she started her work as a producer.

In the United States 31,416 similar official, 365-day produc-

tion tests, made by Jersey cows of all ages during the past thirty-seven years, give the Jersey breed an average of 490.02 pounds butterfat, 9,127 pounds milk averaging 5.37 per cent butterfat, actual production. Individually, more than 40 United States Jersey cows have yielded in excess of 1,000 pounds of butterfat each in a year, April Pogis of H. P., Vermont-bred and tested, leading with a record of 1,218.48 pounds of butterfat, 17,880 pounds of milk in a 365-day test.

The Jersey breed's proven adaptability to changing conditions and climates could have had no better example than "Elsie." From her quiet birthplace she entered the New York World's Fair hubbub, calmly accepted the fish bowl existence and the rotolactor milkings without showing a single ill effect. Late in July, with her attendants, she entrained for Hollywood to play an important role in "Little Men," making numerous "personal" appearances en route. Arrived with a big collection of souvenirs and city keys, she played every act without a stand-in, and presented her admiring movie colony public with a calf, her sixth. "Beulah Borden," the beautiful calf with true Jersey adaptability, immediately took her place beside "Elsie" for all Hollywood and World's Fair events. The Fair ended late in 1940, "Elsie," without any vain regrets, retired to a dairy farm for the winter and at 8 years of age went back to the steady job of producing milk. None the worse for her eventful spotlight days, she gives every evidence of demonstrating another Jersey characteristic, longevity, by continuing her life of usefulness for years to come. In her home herd at Elm Hill Farm, in Massachusetts, as on other farms the country over, Jerseys have repeatedly given their owners many extra producing years. Her sire, You'll Do's Volunteer, lived to be over 16 years of age in the Elm Hill herd and has 81 tested daughters. Fancy Brown Bell, also in this herd, lived to be 17 years old and yielded over 3,500 pounds butterfat in five official tests, once producing 880.28 pounds butterfat in a year.

In the adjoining state of Connecticut, another Jersey cow, Radiant Romance Storrs, lived to be over 16 years of age and before her seventeenth birthday had produced more than 7,500 pounds of butterfat, 150,000 pounds of milk.

Likewise, early maturity is a widely-recognized characteristic of the breed. "Elsie" started her first test at 2 years and 5 months of age. In oregon, St. Mawes Lad's Lady set a national record for the breed for yearling butterfat production by yielding 829.09 pounds of butterfat, 11,756 pounds milk in a 365-day test

started when she was 1 year and 11 months. In the same state, The Lion's Lilac topped 305-day United States records for yearling Jerseys with 742.44 pounds butterfat, 10,752 pounds milk made in a test started at 1 year and 9 months.

Leading all dairy breeds for richness of milk, the Jersey's national average of 5.37 per cent fat means exceptionally economical production of butterfat in any herd, and her medium size is another factor in her favor. She rarely weighs more than 1,100 pounds, averaging around 1,000 pounds, and, as a natural consequence, requires less feed for body maintenance, and incidentally, less dairy barn space.

The American Jersey Cattle Club, national organization of breeders of Jerseys which has many functions as well as the purebred registration function, is the oldest such association in the United States, having been founded in 1868. The Club sponsors many progressive programs for the development and improvement of the Jersey breed, and the six million or more Jersey pedigree and production records preserved by the Club provide valuable data for the use of breeders throughout the world.

Jerseys were shown in the first United States Dairy Cattle Show, Philadelphia, 1856, and Jerseymen early set up a conformation scale of points for the breed in this country. Under the sponsorship of the Club, breeders may have their cattle classified for conformation by approved dairy cattle judges; are provided with two systems of checked and verified production records, Herd Improvement Registry for entire herds and Register of Merit for testing individual cows; and are furnished information concerning production and pedigree records which identify certain sires as Tested Sires when as many as ten daughters have completed production records, and as Superior Sires when certain standards for both production and conformation of daughters are met.

Likewise, carefully tabulated pedigreeds provide ratings for young bulls based on the records of their ancestors as one, two, three and four "Star Bulls." Many other standards for evaluating Jerseys are provided and announcement has been made that selective registration of sires will begin January 1, 1942.

For more than a hundred and fifty years all except Jersey cattle have been excluded from the Island to keep this breed pure, and the history of purebred Jerseys in the United States is a matching story of careful breeding and development with the Jersey steadily increased in favor from year to year.

The annual report of The American Jersey Cattle Club for the fiscal year ended in the

Spring of 1940 showed 48,078 Jersey cattle registered in the Nation and 25,049 registered Jerseys transferred to new owners during this year. Despite the uncertainty concerning the future of the Jersey breed on the Island of Jersey, American breeders have for many years depended in the main on American-bred Jerseys, for from 1850 until April, 1940, only 26,422 head were imported to the United States while in the last 72 years a total of 1,657,869 head of purebreds have been registered in this country. At the present, more than 10,000,000 Jerseys, purebred and grades, are on United States farms.

Among outstanding 1940 examples of high production in American-bred herds are the herd owned by the J. W. Coppini Estate at Ferndale, Cal., and the herd owned by E. S. Brigham, St. Albans, Vt. The Coppini herd of 18 homebred cows, milked twice daily, has completed its eleventh consecutive yearly herd production test with an average of 568.98 pounds of butterfat and 9,572 pounds milk per cow. The herd has exceeded a 500-pound butterfat average per cow for each of the eleven tests and all were made on twice daily milking. The Brigham herd led the nation for production by large herds milked twice daily with 104 cows, all homebred, averaging 455.23 pounds butterfat, 8,796 pounds milk per cow.

Tin Can Irrigation

TIN cans were used for a tile line to subirrigate a garden made by Clarence Hake, 12-year-old 4-H Club members in Mitchell county, Kansas. He had an opener that cut tops and bottoms out smoothly, leaving a bead around each rim. Level trenches were dug, then a line of cans was laid end to end in each. A solid line of smaller cans was placed inside the first line to make it double. The inside row of cans was laid so ends met at the center of those in the outer line. That, Clarence believes, will keep the inner line from filling with silt.

—*Capper's Farmer*

Soybean Milk!

Condensed from The Ohio Farmer

LITTLE would anyone believe that the crash of exploding Japanese bombs in far off China would mark the founding of a new agricultural industry in Ohio, but such has been the case. Today, at Mt. Vernon, stands a plant producing soybean milk, powder and a number of other products made from the edible soybean, located there because the original plant for making these products was destroyed by bombs of the Japanese in Shanghai.

Head of this industry is Dr. H. W. Miller, born in Miami County, Ohio, and educated as a surgeon. For years Dr. Miller was located in the Orient as head surgeon in an American mission hospital. During these years he saw the need of the Chinese for milk and other dairy products. Cows' milk for many of these people was entirely out of the question because of lack of adequate supply and also because of cost.

Milk in many Chinese cities cost 75 cents a quart in Chinese money, the equivalent of about a quarter in our money at that time. For years the soybean has been the staple item of food in the Oriental diet and has served especially as a source of protein.

Some years ago Dr. Miller and his associates developed a plant for production of soybean milk in Shanghai. At the time of the Japanese invasion in 1937 they had 15 delivery boys going out each day on bicycles to deliver milk to thousands of customers. Suddenly, with the falling of a few bombs the plant was wiped out and Dr. Miller decided to relocate his plant in Knox County, Ohio.

Thus the International Nutrition Laboratory near Mt. Vernon came into being. Here Dr. Miller and his sons have built and are now operating a plant that produces soybean milk, a product that resembles cows' milk in appearance and analysis. According to Dr. Miller, this vegetable milk is more quickly assimilated by the body than animal milk, it gives a quick recovery from exhaustion and fatigue, and is especially desirable as a food for infants and invalids.

The liquid and powdered soybean milk produced in this plant is sold to doctors and hospitals all over the United States and some of the powdered product even goes all the way to China and other Oriental countries. Health stores in this country also handle these soybean products.

Reprinted by permission from The Ohio Farmer, Nov. 30, 1940, Cleveland, Ohio

A number of interesting processes are necessary in the production of soybean milk. Edible varieties are used, as they do not have the bitter taste that is so objectionable in the ordinary varieties grown for livestock feeding. The mature, dry beans are soaked, then ground into a pulp. After grinding, the pulp is run through an extractor that removes 90 percent of the protein contained in the ground beans.

The liquid that is extracted from the pulp is cooked and at this time fats and carbohydrates in the proper amounts are added. After mixing and processing have been completed the product may be evaporated and canned, or spray dried and packed as a powdered milk. Both the liquid and powdered milk may be obtained in either natural or chocolate flavors.

Like the pioneers in any industry, the Millers were forced to design and build much of the machinery needed for their plant. One of the sons was in charge of construction and installation of this equipment. Even after the machinery was in operation, they found many improvements in operation and types of equipment that have increased the capacity of the plant.

Other Edible Soybean Products

In addition to the soybean milk this plant is also making a number of other edible products from the soybean. One of these products is Mien Jing, an Oriental name meaning processed gelatin. This product is made from the gluten of wheat flour to which is added fresh vegetables and soya sauce, making a nutritious food with a meat-like flavor.

During the past summer this plant also packed a quantity of edible soybeans. These were canned, both as green beans, and dried beans with tomato sauce added. Another product is a soybean flour that may be combined with wheat flour in baking bread or other products. It is claimed that while wheat flour is among the acid foods, soybean flour is strongly alkaline and that one part of soybean flour will neutralize the acidity of four parts wheat flour.

At the present time another plant for the production of soybean milk is being established by this organization in the Philippine Islands. Only recently a shipment of 2000 pounds of the powdered soybean milk left Mt. Vernon for China.

What is Ecological Thinking?

Condensed from Soil Conservation

Edward H. Graham

SOME years ago a farmer in New York State was complaining to a friend that there were no longer any ducks on the big marsh at the lower end of his farm.

"Herb," he said, "you're a biologist, can't you tell me why I haven't any ducks anymore? There used to be three or four broods come off that marsh every summer."

"Well, John, I don't know. It might be for any one of a dozen reasons. Let's walk down that way and take a look."

But it was not settled in one afternoon. Herb made several visits to the marsh at different seasons of the year until, bit by bit, he pieced his observations together to make a complete picture. Then the biologist met his friend again.

"The ducks are gone," he said, "because the boys are trapping all the skunks."

"Why, what in thunder have skunks got to do with the ducks?" John retorted, "I'd think trapping the skunks was all to the good, if you ask me."

"Maybe so," continued Herb, "but the situation looks like this. Skunks dig snapping turtle eggs out of the sand where they're laid, and eat them. When the fur-prices went up and the boys started trapping skunks the turtles had a chance to multiply. But there wasn't enough food down there for them and they began to feed on the ducklings. Ducks won't nest where they are molested that way, and so they have gone somewhere else. If you want those ducks back you'll have to quit trapping the skunks. Their hides aren't worth much now anyway."

John was not convinced, but the ducks had been the pride of the whole family, so he decided to try the biologist's suggestion. Today there are as many ducks as ever. For when trapping ceased, the skunk population increased with a resultant drop in the number of snapping turtles; the turtles no longer exerted pressure on the ducks, which returned to nest at the pond; and something like the previous set of relationships was established.

The biologist had attempted in this instance to deal with all the factors affecting a given situation, instead of considering a single factor to the exclusion of others that might have an equally important influence. This is an example of ecological thinking.

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Cattle Health Crusades Advance

Condensed from Farm Journal and Farmer's Wife

TWO important pieces of livestock news have recently come from the U. S. Bureau of Animal Industry. First is the announcement that an intensive 23-year campaign has been successful—the campaign to rid cattle of bovine tuberculosis in the United States.

With the completion of the area testing program in Kings and Merced counties, California (the last two counties of the last state) less than two months ago, the United States was declared "practically free" of bovine tuberculosis by Dr. Mohler, head of the Bureau and commander of the forces engaged in the campaign that started in 1917.

Total cost to taxpayers of this clean-up campaign, down to the penny, was $273,095,843.42. Tear that huge figure apart and you find that $187,343,746.01 was paid out (state and federal funds) to herd owners for animals slaughtered. The operating cost of the campaign was $85,752,097.41. The total number of tests administered was over 230,000,000, at a cost of about $1.20 per test. The total number of animals slaughtered was 3,772,000. The average cost of the campaign was $90 per cow. The average indemnity payment per cow was $49.66. Not computed is what farmers contributed in terms of cow value above the indemnities received.

Half of the entire 217,491,705 animals tested were in eight states: New York, Iowa, Wisconsin, Illinois, Minnesota, Pennsylvania, California and Michigan.

The campaign was not without some opposition from herd owners. The Tall Corn state does not like to be reminded that it was necessary to call out the state militia to enforce the test. In other states, too, it was necessary to use law enforcement officials to administer the test.

The second piece of news was given out by Dr. Mohler in Chicago, December 5, where he spoke at the annual convention of the U. S. Livestock Sanitary Association, and outlined a plan for official recognition of vaccination of calves as an aid in control of Bang's disease. The plan is not compulsory. It is not yet in operation; it will go into operation when the proper authorities in the various states ask for it. The high points of the plan follow:

In a herd where calfhood vac-

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cination becomes a part of the Bang's disease control procedure, all animals over six months of age would first be subjected to a blood agglutination test and then tested at least once a year thereafter. Vaccination would be confined to calves between four and eight months of age, preferably during the sixth month of the animal's life. Age of animal, date of vaccination, record of tests, etc., would be carefully kept so that the identity of each animal could be properly established in each case. A herd would be certified as a free herd for a period of one year when all animals in the herd over two years old show at least two negative reactions.

Only on written permission from co-operating state or bureau officials could positive animals in herds where vaccination is practiced be disposed of for any purpose except immediate slaughter. Where vaccinated animals over 30 months old (that were vaccinated between four and eight months old) disclose a positive reaction and the owner wants to sell them, a joint indemnity payment is recommended.

Minor details in the plan would be delegated to co-operating state and federal officials in the various states to determine whether the interests of the industry in their states would be best served by continuing the test-and-slaughter method, by adopting calfhood vaccination as outlined in Dr. Mohler's plan, or by using calfhood vaccination as an aid to the test-and-slaughter method. The Bureau will co-operate fully in the course decided upon by the various states. Present regulations in quite a few states will have to be changed in some respects.

"Calfhood vaccination involves close attention to exacting requirements if it is to be successful," Dr. Mohler emphasized. "Under no circumstances should the vaccine be used promiscuously by untrained persons.

Cold Room Electric Brooding

Condensed from Electricity on the Farm

A. V. Krewatch

THE Vocational Agriculture classes, composed of both 4-H club and F. F. A. boys, at the Arundel High School, Millersville, Maryland, record-breaking cold room electric brooding demonstration under the guidance of their instructor, Mr. A. Z. Gottwals, last winter. The demonstration showed that cold room electric brooding in mid-winter is practical and a fine rate of growth of chicks is obtainable with good feed and good electric management.

In ten weeks the 200 birds consumed 1,625 pounds of feed, producing 560 pounds of flesh. One pound of flesh was produced for every 2.9 pounds of feed consumed by the chicks, a new Maryland record. The cost of producing these broilers weighing 2.8 pounds in 10 weeks, according to the records kept by these boys, and including current, litter, chicks, losses, and feed, was 34.5 cents per bird. The average selling price was 52 cents per bird. The chicks were Red-Rock crosses.

The brooder maintained a constant temperature under the canopy of 95 degrees the first week, 90 degrees the second week, 85 the third week, and from then on 80 to 75 degrees. During the 10 weeks, 267 kilowatt hours of electricity were used. Only 8 chicks were lost, 6 of them accidently by the boys stepping on them when they were feeding, watering, and caring for the chicks. The brooder house was built on the high school grounds and the chicks received limited attention on week-ends.

From January 3, 1940, when the brooder was started until the end of the 10 weeks mid-winter period, the temperature in the brooder house as recorded at 8.00 A.M. each morning went down to 10° above zero or lower 8 days. Five degrees above zero was recorded three times and 6° and 8° each once. The average morning temperature in the house throughout the entire brooding period was 31.6° F. and it never got above 64° F. It is natural that temperatures during the early morning hours were lower and somewhat higher during the day. Outside temperatures during the brooding period went to 9° F. below zero.

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Modern Shepherds

Condensed from The Western Farm Life

John L. Sinclair

TWO riders mounted on stocky little cowponies trotted their horses along the rocky ridge. Their spurs jingled, leather chaps flapped, and the wide brims of their hats curled in the breeze. Their high-heeled boots, stock saddles and lariat ropes branded them as range riders—not cowboys exactly, but first cousins to those colorful horsemen of the American West—riders of the sheep range.

On the ridge across the canyon another rider could be seen keeping his horse at a steady trot; his eagle eyes surveying every cranny along the rocky slope. He rides onto a score of sheep grazing the ridge . . . a cowboy yell and the woolies scamper down the canyonside. He spurs his pony on until he meets another band and hazes them into the canyon.

The two riders on the opposite ridge do likewise until the scattered sheep become small bands in the canyon. This operation goes on until they come to a long woven wire fence that stretches for miles over the range, crossing canyons and traversing ridges—a barrier marking the end of the pasture. Meanwhile, horsemen ride the canyons gathering the sheep into one vast herd and drive them toward the corrals. Whistling and whooping men on horseback arrive with bleating sheep from all directions. The sheep penned, they are ready to be "worked."

This is a roundup on one of the large sheep ranches in the "wolf-proof pasture" section of southeastern New Mexico. Ranchmen in this country have laid off the lazy and unreliable Mexican sheepherder and enclosed their ranches with a strong 35-inch netting fence, making it "wolf-proof" by placing two to four strands of barbed wire on the top and laying a carpet of rocks along the base.

No longer do Juan and Pedro, the sheepherders, discuss the plight of the Southwest since the hated gringo arrived, while they eat a leisurely breakfast and hold the sheep on the bedground until long after sunrise. For, when dawn breaks on the fenced sheep pasture, the woolies rise as they please, and scatter out to get full benefit of the luscious grama grass with no herder to hold them

Reprinted by permission from Western Farm Life, Nov. 1, 1940, Denver, Colo.

back. When night falls they may graze about until darkness overtakes them.

A ranch in this part of New Mexico will be fenced and cross-fenced into a horse pasture adjoining the "headquarters," as well as a buck pasture, and according to the area of the range a number of sheep pastures. As the range carries roughly 200 head of sheep to the section, pastures average five sections, thus making them workable for 1,000 head. Fencing is always in progress on these ranches and as time goes on pastures are cut into smaller units. This facilitates rounding up, eliminates hard riding and keeps stock in smaller bands. Ranches average 30 to 35 sections but some run to 100 sections and more.

The practice here is to let the job of fencing out to a contractor. The rancher buys the material, has it freighted to a convenient point along the fenceline, and the contractor and his crew do the constructing. The cost runs at about $350 a mile. Posts are set about 30 feet apart and 18 inches in the ground. Corner and gate posts are well braced and set 36 inches. Where the ground is covered with hard rock 6-inch holes are drilled and steel posts driven into them. In this rocky country about 22 per cent of the posts are steel.

A rider is paid a wage of $40 a month and board. He is furnished a mount of 5 to 10 saddle horses . . . changing horses once or twice a day. Like the cowboy on the cattle ranches he has his own riding outfit. A 30-section ranch will employ two steady riders and take on extra help for rounding up, shearing and shipping. A rider's duties are to ride the pastures, keep the windmills in repair, scatter the sheep onto the grass, doctor worm infested sheep, set traplines for predatory animals, ride water-gaps and repair fence.

Roundups are held frequently for such purposes as marking and branding lambs (branding is done with a hot iron on the nose . . . each rancher having a brand registered with the sheep sanitary board), shearing, shearing eyes, weaning and shipping.

Lambing loss, the costliest item on the "under herd" rancher's budget, is brought to a minimum in the pasture system. Ewes lamb in the pastures and are molested as little as possible. A ewe left to herself at this period is apt to claim her lamb better than one that is constantly herded. The "dogie lamb" problem was one of the trials and tribulations connected with the "dropping herd."

A lamb crop will run 80 to 90 per cent in these pastures. Ranches stocked with breeds such as the Corriedale, which is famous for twins, will have a lamb crop as high as 105 per cent. Lambing starts in the beginning of April.

Shearing is done in June, although some ranchers prefer to get the wool off the backs before lambing . . . this means shearing in the tricky month of March. The altitude in this section runs from 3,500 to 5,000 feet; cold weather and snowstorms have been known up to the last of May.

There is a great deal of controversy on the part of ranchers as to the best time to shear. Those who favor shearing before lambing time claim that the heavy fleece is an extra load on weakened ewes in lamb. A ewe grazing the steep slopes falls on her back and weighted down by the heavy coat of wool cannot regain her feet. She stays there until someone rides to her rescue. A solitary ewe lying low among the zacahuista in a 5-section pasture is as hard to find as the proverbial needle in the haystack.

June-shearing ranchers claim that one good snowstorm will raise havoc with a newly shorn flock of sheep and that the loss is about the same either way. The average clip is 10 pounds of wool to the fleece; 7 to 8 pounds from old ewes.

Lambs are weaned and shipped in October. A 60- to 65-pound lamb is the average and desirable weight. Double-deck trucks hauling 140 lambs to a load will make quick work of shipping a couple thousand sheep. A fleet of six of these trucks will solve a rancher's shipping problem. The sheep ranchers of this district are a boon to the trucking companies which are kept busy throughout the year hauling sheep, wool and supplies.

Rambouillet and Delaine Merino are the favorite breeds of New Mexico sheepmen. Shropshire, Suffolk, Cheviot, Romney Marsh, Southdown, and Hampshire have grazed the fenced ranges. The Corriedale is fast becoming a favorite due to the fact that it is ideally suited to the pastures. Their head free of wool eliminates the extra roundups necessary when shearing eyes; their clean legs give them free action, thus making them work better in a roundup (it takes a good horse to turn a healthy Corriedale ewe). The ewes are good mothers and very prolific . . . twins are very common. The lambs average 65 pounds at weaning and the meat is of excellent quality. Their wool rivals any on the market in regard to price and averages 10 to 12 pounds a fleece. The Corriedale is the ideal dual purpose range sheep.

Sheepherding on these ranches is a white man's job. The boys who handle the stock could not be talked into herding on foot.

Juan and Pancho have gone to other ranges. They are replaced by intelligent stockmen—horseback men of the West.

Breeding for Hatchability

Condensed from Everybodys Poultry Magazine

G. T. Klein

Massachusetts State College

WE have only to study family hatchability records in poultry to see that breeding is only one of the several factors that influence it. When the sisters in one family give an average hatch of 92 per cent of the fertile eggs and the sisters in another family average 57 per cent under identical housing, feeding and management conditions, it suggests that heredity is playing its part. Heredity seems inescapable even in hatchability, and poor hatches of mediocrity are transmitted just as well as hatchability of 85 per cent or better.

The progeny or family basis is the best way of studying hatchability. Trapnesting and pedigreeing is, of course, quite essential. As eggs are taken from the trapnest, they are marked with the leg band number of the hen. The eggs from an individual hen are hatched in a tray, a basket or a mesh bag which can be securely closed. With wing bands and adequate record forms, the chicks are identifed throughout their life. Their production, hatchability and performance is then made possible for study and selection.

There seems to be little if any hereditary relationship between fertility and hatchability from our studies at Massachusetts State College. Hatchability is very definitely inherited, but breeding seems to have little influence on fertility unless it be that inbreeding lowers it.

High hatchability, medium and low are definitely suggested in our studies. These are expressed in terms of hatchability percentages of fertile eggs which have been arbitrarily set as low—less than 55 per cent; medium—55 to 84 per cent; high—above 85 per cent.

Selecting for Hatchability

The application of this program has been to select for use in the breeding pens, males from dams that gave 85 per cent hatches and to mate these to pullets of similar breeding or to hens that have proven their value in this respect. This program applied to the experimental flock at Massachusetts State College has given very satisfactory results. The year to year variation in

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hatchability of fertile eggs follows:

1927—57%	1933—82%
1928—63%	1934—80%
1929—78%	1935—81%
1930—74%	1936—84%
1931—70%	1937—80%
1932—61%	1938—86%

This program has been very successfully followed by poultry breeders in Massachusetts. In 1937 the R. O. P. flock at the Norfolk County Agricultural School gave a fertility test of 91.9 per cent, a hatchability of 87.9 per cent of fertile eggs. Ten pens of advanced R. O. P. hens (240 eggs or more) mated 10 to 15 hens and one male gave an average of 87.7 per cent fertility, 80.0 per cent hatchability of all eggs set, and 91.2 per cent hatch of the fertile eggs. These results were obtained in the comparatively short period of three or four years of breeding work.

At the Crooks Farm in Massachusetts, hatchability increased from 66 per cent of all eggs set in 1930 to 82.2 per cent in 1939 and hatchability of fertile eggs reached 88.5 per cent in 1938. In 1939 this flock gave a hatch of 82.2 per cent of 107,250 eggs set.

Fertility Better on Pullets

There is but little difference in hatchability of the different age mothers. Fertility, however, averages from 5 to 8 per cent higher from pullet than from older mothers. A summary of fertility and hatchability shows the following differences for pullets, yearlings and older breeders.

	Pullets	Yearlings	Older Hens
Fertility	86	75	68
Hatchability (Fertile Eggs)	71	76	72

The results that have been given are for flocks fed the cafeteria system. Mash, oats and corn have been available for them at all times and some germinated oats have been fed.

Research on Grass

Condensed from Farm and Ranch

RESEARCH on grass is twenty-five years behind that of other crops. While scientists have bred wheat for milling barley for malting, cotton for yield and staple, grass length has been neglected.

There are big possibilities in grass improvement when the research workers bring in their reports on the subject. Thus quality and yield of Rhodes grass, the fine forage crop of the area south of Victoria, will be greatly improved when the best of its hundreds of strains is selected and made available for plantings.

At the Experiment Station at Woodward, Oklahoma, D. A. Savage and his co-workers have been working on such things as developing a bi-sexual buffalograss—the grass now has separate male and female plants . . . that will develop seed at a height that can be harvested mechanically instead of close to the ground as is now the case.

These are some of the things that were brought out at the Grassland Conference—one of the five scheduled this year in the United States—held at Amarillo and sponsored by the Southern Great Plains Regional Council.

While the program was arranged with the Southern Great Plains in mind, it touched on phases of interest to every farmer and rancher. Ecology—the branch of science concerned with a study of the conditions that cause a succession of grasses—came in for its share of discussion. Ecologists told the story of the once splendid grassland of the Great Plains, now punctured full of holes by the plow, worn thin by livestock, and tattered around the edges in places where forests and desert have overcome the weakened grass.

Ecology explains why the blue stem of the Gulf Coast prairie had been replaced by coarser grasses and weeds, why mesquite, cactus and cedar are spreading over the Rio Grande Plain and the Edwards Plateau, why creosote brush and bitterweed and snake root are taking the place of the gramas and tobosa in West Texas. Knowing what has gone before, science can tell what is going to happen in the future under any given set of conditions.

Range management has an important part in this future. This includes rate of stocking and conservation measures, such as building of tanks, deferred grazing, and contour listing, speakers pointed out.

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How Lights Affect Fertility of Eggs

Condensed from Turkey World

P. H. Margolf

Pennsylvania State College

FOR several years attempts have been made on Pennsylvania State College Farm to secure poults from breeders exposed to early morning lights during the winter months. The egg production realized from these trials was pleasing, but the amount of infertility of these eggs was appalling.

In planning the work for 1939-40, we assumed that *the reproductive organs of the female develop more rapidly in response to lights than do those of the male. If this is true, eggs are therefore laid by the hens before the toms have developed sufficiently to fertilize the eggs.*

Accordingly, on December 14, 1939, 10 female and 10 male turkeys, 32 weeks of age, were housed in a pen 12 by 20 ft. and put under lights. The pen was provided with one 60-watt incandescent bulb with no reflector. Light was given the birds daily from 4 a.m. until daylight.

At the time these were housed one male and one female of the same age and breed were killed, their reproductive organs removed, and examined for the stage of development attained. At weekly intervals, thereafter, two hens and two toms were killed from the group placed under lights and a similar examination was made. At weekly intervals two turkeys of each sex were killed, until all of the original 20 birds were examined. The hens examined at the end of the third, fourth and fifth weeks were all found to be laying. The testes of the toms killed each week were examined for the presence of motile sperms by Dr. W. T. S. Thorpe, Veterinary Science Division, Department of Animal Husbandry. An extraction was made from each testis by the use of a hypodermic needle syringe. Smears of the contents were made on slides and examined under the microscope. Sperms were reported in the left testis from males killed at the end of the third week but they were not motile. Of the group of toms killed at the end of the fourth week, one showed motile sperms not only in the testis but in the vas deferens as well. The other male showed no motile sperms in the vas deferens but motile sperms

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were found in the testes. Both of the males remaining at the end of the fifth week were in a high state of production of motile sperms. Apparently, young toms require from four to five weeks under lights before they are developed properly sexually.

At the same time the 10 hens and the 10 toms were exposed to lights, four other White Holland males were also placed under similar environmental conditions. These toms were to be mated with 20 White Holland hens. The hens, however, were not given lights until the toms had been exposed to lights for five weeks.

Two adjoining pens were used, one for the males and the other for the females. All hens were blanketed with turkey saddles, and the band number of each hen was printed on the saddle in a conspicuous place.

When the hens had been exposed to lights for four days each tom was individually given access to the pen of hens daily. The toms wers also used in a regular routine order each day. Tom A would be used first on one day, second on the next, third the next day, etc. A record was kept of each mating that occurred. Some toms mated as many as three hens each day.

All hens were trapnested, the eggs were marked, and fertility and hatchability data were collected. All birds reached sexual maturity at 278 to 286 days. This period of time included 17 to 25 days under lights, an average of 20.11 days.

During the period of the day when the males were given access to the pen of hens, the trapnests were emptied of all birds. When a hen showed broodiness she was removed from the pen and placed in a large wire-bottom holding crate. This crate was kept in the pen with the toms. Once each day the broody hens were released from the crate and allowed to mingle with the toms. When any one of the hens showed aggressiveness and was mated she was put back in the laying pen.

Several birds went through their first broody period during the last week the birds were under lights. In this period production declined and the percentage of matings increased. It appears that at the end of the hen's broody period aggressiveness toward mating is again revived.

When egg production is forced by the use of artificial lights, it appears that aggressiveness or willingness to mate on the part of the hen is greatest prior to laying and then decreases as the birds continue to lay.

With this in mind, let us observe the comparative development of the male and female reproductive organs in response to the stimulus of artificial light. In the figure showing this state of development weekly, the toms were not ready to produce motile

sperms because *their reproductive organs did not develop sufficiently until the fourth or fifth week of artificial illumination.*

If toms and hens are placed under lights at the same time for the forcing of seasonal poult production, the hen is ready to produce at the end of the third week of illumination, but the tom requires from four to five weeks of illumination in order to produce motile sperms. Also, it is observed that the hen does not wish to mate after it is in production. For this reason, the tom cannot fertilize eggs until such time as the hen is no longer interested in mating. Therefore, toms should be placed under lights at least four weeks before lights are given to the hens.

Good results in producing fertile eggs when turkeys are lighted are possible only when other factors are given their rightful consideration. Relying on lighting alone will not produce results.

Efficiency of production in any flock depends upon:

1. *Inheritance of vigor and vitality.* The careful selection of the breeders to be used cannot be overemphasized.

2. *Suitable environmental conditions under which the flock is housed.* Dark, dingy, poorly ventilated pens with little or no sunlight available are not suitable for the production of fertile eggs.

3. *Adequate nutrition* also must be supplied in the form of clean, wholesome feeds, with the nutrients qualitatively and quantitatively balanced. And always remember that water is an essential nutrient.

One Cow

A certain farmer had a big farm with the same kind of a mortgage on it. He found it hard to pay expenses and interest, so proposed to sell out, get a smaller farm and have less worry about debt. Just then he met a friend who told him that with several sons growing up he'd better stick to the big farm, invest in a few good cows and try to become a skillful dairyman. So he went to a sale of pure-bred Holstein cattle and bought one cow for $112. That purchase was the turning-point in his business career. His pure-bred cow had four heifer calves in a row, the foundation of an excellent herd. His mortgage was paid off gradually, then he bought another farm and paid for that. So instead of reducing his farm enterprise he expanded it.

—*Pennsylvania Farmer*

Pumped Up Lambs

Condensed from Capper's Farmer

Grady Sellards

Kentucky College of Agriculture

JIMMY McCANN had been betting again. It happened one day when he took a lamb carcass, one of his own dressing, in to the local butcher, that being in the days when the local butcher did most of his own slaughtering.

"That carcass," said Mr. Jimmy, "was as white as the breast of a chicken." And, of course, that was what fooled the butcher. He hadn't been able to bleed his that thoroughly.

Said the butcher, "I'll bet you $100 that you can't dress one of my sheep to look like that."

Mr. Jimmy was in no mood for trifling, because he knew that would be an easy "hundred" to pocket. So almost before the words had quit sounding in his ear he was signing his name to a check for $100 for putting up, or else shutting up the butcher.

The butcher took the less expensive way out, but promptly began buying a few lamb carcasses from Jimmy McCann, which explains how it was that I stumbled upon some new technique in the art of dressing a lamb carcass.

I was in Fleming county, Kentucky, to give a lamb-carcass-cutting demonstration. The county agent and I went for the carcass we were to use. When I saw it, I asked the salesman from what packer he had obtained such a beautiful carcass, whereupon, I was informed that it had been dressed locally. "Yes," continued the salesman, "a man out in the country does it; pumps the pelts off with a bicycle pump."

A rather ingenious method, I thought, suggesting to County Agent Orem LaMaster that we see the McCanns demonstrate their new technique.

"No," said Jimmy McCann, "we don't pump off the pelt. You couldn't do that. Rather, we pump the carcass up tight, thus forcing out the blood, even from the minutest veins and capillaries. It's easier to remove the pelt from a pumped up lamb."

But Mr. Jimmy had to suspend his talking temporarily, for his son, John McCann, was then

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about ready to show us what we were being told. After bleeding the animal in the orthodox way, and severing the spinal cord to stop any pain, he made an opening in the hide on the inside of a hind leg and about 6 inches below the hock. Then a steel was forced in about 5 or 6 inches and between pelt and fel. The hose of an ordinary bicycle pump was inserted at that point and extended well up into the opening made by the steel. Gripping with his left and pumping with his right hand, he continued until the pelt was almost as tight as a drum head, after which he removed the pump and tied a string around the leg.

In the meantime, I noticed that the bleeding continued. Why shouldn't bleeding continue with all that pressure behind it?

John took up his knife, opened the pelt along the underline and about half way down. Then he skinned the brisket and front legs, after which he began fisting off the pelt, and all was easy until he got to the hind legs where the knife had to be used again.

After removal of the entrails, the carcass was wrapped in a cloth, sewed on, and then removed to the smokehouse where it was hung.

In dressing the sheep, not a drop of water was used on the carcass, confirming again the thoroughness of the bleeding.

"But aren't you going to place that carcass in a refrigerator?" I asked. I couldn't help but wonder what might happen to a freshly-slaughtered carcass in temperatures in the seventies and eighties—and with no refrigeration!

"We don't plan for any refrigeration," said John, "that lamb will keep till we finish it." He went on, however, to point out that if extreme summer heat should suddenly descend upon him that he'd probably store the carcass in a refrigerator.

"Lamb and mutton," observed Mr. Jimmy, "is a great summer meat, but give me the carcass of a yearling every time in preference to that of a lamb."

"Why?" I asked.

"Oh, there's just more flavor to it."

The Right Swine Type

Condensed from Successful Farming

E. F. Ferrin

University of Minnesota

EVER since swine-production became an important industry in the United States a century ago, hogs have fluctuated from large to small size, from late to early maturity, from stilty to stumpy legs. These periodic changes did not result from attempts to meet altered market demands, but rather were due to the whims and fancies of hog-growers. Only during the early history of swine-production in this country did the prevailing type of hog happen to fit the real needs of the trade.

Until around 1875, pork was largely a cured product. The heaviest, fattest cuts took the strong, salty brine with least hardening of the tissues, and made the best-quality salt meats; packers, accordingly, paid a premium for heavy, overfat hogs, and farmers competed for prizes offered for the production of the heaviest dressed hogs. The white hogs of Chester County, Pennsylvania; the Jersey Reds; and the early Poland Chinas all grew to mammoth size. The largest of these were the red hogs, but both the other breeds are credited with carcasses ranging from 1,100 to 1,200 pounds in weight. It took two and one-half to three years for a hog to get so heavy, but there was no hurry in those days.

Artificial refrigeration from 1875 on revolutionized the meat business by making it possible to have fresh cuts the year around; but for many years there was no demand, as at present, for lean, lightweight pork products. A strong domestic and export demand for lard, and to a smaller extent for pork, made the 350- to 400-pound hog the most desirable. In spite of this market condition, producers began to swing to a small "cob-roller" type about 1890. The change was most evident in the Poland China breed, but hogs of all colors were more or less affected. This was probably the most unprofitable type of hog ever produced in the United States. One breeder is reported to have said in disgust that his sow farrowed twins, ate one, and laid on the other!

The reaction brought in the "big-type" hog and again demon-

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strated that type swings in swine tend to go too far before they can be stopped. We need to go only as far back as 1928 to 1930 to recall the greyhound kind in several breeds, and there are today some traces of them left.

The knockout blow for the leggy, slim-middled hog was the feed shortages during the recent drought years. There wasn't enough feed to make such hogs really finished for market, and nothing the packer could do would make good-quality cuts from the carcasses. During this period, smaller supplies of lard gave the substitutes an entering wedge into the domestic and foreign fats-and-oils business, and producers, more market-conscious than formerly, began to notice the pronounced demand for small, lean cuts of pork. An earlier-maturing type came into favor.

The swing toward an earlier-maturing type in those breeds which featured leggy hogs is now so pronounced that some people are concerned about its reaching the extreme of 30 years ago. This time, however, such a situation may not occur. Market conditions are better appreciated, and type studies by agricultural experiment stations and breed associations have given us a pretty good idea of just what the right swine type really is.

It would seem that neither a small nor a large, but an intermediate, hog is the right type for present market conditions and for the most economical production. The type studies at the Illinois and other agricultural experiment stations bear this out; and breed association type conferences and brood-sow testing on farms, supplemented by carcass data from some of the finished market hogs, have demonstrated the same story.

The market conditions influential in the election of the intermediate hog as the most satisfactory type are numerous. Human diets are much more varied than they were 25 years ago. Meat, bread, and potatoes have been supplemented and replaced by year-around green vegetables; and the multitude of widely advertised breakfast foods has reduced appreciably the use of ham and bacon for breakfast. Even though at least a reasonable amount of fat is essential to the making of high-quality meat, consumers generally look upon the fat portion as waste and turn thumbs down on the heavier cuts.

To top it all off, lard is punch drunk from the onslaught of substitutes and the loss of foreign markets. The huge storage stocks of lard are doing their share to hold swine prices at an unprofitable level, and emphasize the advisability of producing a meatier animal.

No one knows accurately the future possibilities of enlarged

markets for pork products, but the outlook is not encouraging. While the packing business is our greatest United States industry, its products have not been well advertised in comparison with the flood of foods which have come into serious competition with them. Thus we must base our conception of the right swine type on present market conditions.

In general, this intermediate type of hog which seems to fit market requirements best is one which is finished at a weight of approximately 180 to 225 pounds. It has a high proportion of lean to fat, with a moderate fat covering over the back; the ham is deep and plump without an excess of fat; and the belly needs to be uniform in thickness and well streaked with lean. Producers have looked mostly at the backs of hogs and neglected the bacon cut which is nearly as important as the pork loin. Narrow, pinched bellies, and high, thin flanks have not been criticized as severely as is justified.

In addition to these characteristics, sows should have the inherent ability to farrow large litters and to nurse pigs well. Combined with this is needed a strong maternal instinct to watch out for the welfare of the newly born pigs. Rapid growth is closely associated with economical gains and should be considered. Too, early maturity makes it possible for market pigs to be finished at the most acceptable weights—180 to 225 pounds. It should be possible, also, to carry the hogs to weights of 260 to 275 pounds with an economical use of feeds, if market conditions warrant.

Nearly all the specifications for a modern-type hog can be obtained successfully if the extremes of each characteristic are avoided. We need a middle-of-the-road type to prevent a repetition of our past mistakes.

Water-Tight Siding

TONGUE-and-groove lumber can be made virtually water-tight, J. E. Carnahan says, if tongues and grooves are brushed with white lead paint and put together while the paint is fresh. He used that practice in constructing a grain storage bin in Clay county, Kansas. This also should prevent the wood from decaying where boards join.

—*Capper's Farmer*

The History of the Postal Service

Condensed from The Southern Planter

James A. Farley

OF all the agencies of government, local, state and national, there is none which comes in such intimate daily contact with people in every section of America as does the United States Post Office Department.

Of all the implements of democracy, postal service rightfully may be termed the strongest and most far-reaching. It is the medium through which men and nations have been bound together for centuries; and here in the United States, history shows us that it was the Post Office Department that played a major role in the early development and later expansion of the new republic.

Postal service in this country dates from 1639 when the General Court of Massachusetts, by ordinance, legalized a means of communication whereby it was directed that all mail brought from over the seas should be left at the home of Richard Fairbanks, in Boston, who in turn would see that it was transmitted to the proper part of the new colony to which it was addressed. He was allowed a penny for the transmission of each letter and was accountable to the authorities in charge of the colony for any neglect of duty.

The first step to establish an inter-colonial post was taken by Governor Lovelace, of New York, who in 1672 organized a monthly post between New York and Boston, and it was over this route that the old New England post route riders maintained a regular service. It is interesting to note that the main highway from New York to Boston to this day is known as the Boston Post Road, and as such bears this name in the various communities through which it passes.

In 1683 Governor William Penn, of Pennsylvania, established a post office at Philadelphia and Henry Waldy, the first postmaster, was authorized to supply messengers with horses from Philadelphia to Newcastle or to the Falls of the Delaware, and to send weekly mail between these points. In the same year a regular post was established along the entire Atlantic seaboard, extending from Maine to Georgia, but lack of suitable roads made travel for the couriers on these eastern posts slow and hazardous.

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It was these paths that later became the trunk highways of the Atlantic seaboard as the new colonies grew and expanded; and it was over these post routes that the new settlers made their way.

During the period of the Revolution, the postal department was a very insignificant part of the Government that had been established. The total number of post offices in operation in 1776 was only 28, 14 of which were in Massachusetts. Following the ratification of the Constitution, our present postal system succeeded the continental post office system on September 26, 1789, when Samuel Osgood, of Massachusetts, was appointed Post-Master General by George Washington. The postal service was then subordinate to the Treasury Department, and at that time there were 75 post offices and the mails were carried on 1,875 miles of road. It was not until 1829 that the Postmaster General became a member of the President's Cabinet.

In 1812 there were but four clerks in the post office at New York and part of their compensation was board with the postmaster. Today, New York has more than 20,000 employees, while the entire United States Post Office Department has a total payroll of some 235,000 regular, full-time employees.

The first overland mail to California by way of Fort Leavenworth and Santa Fe arrived in Los Angeles on its way to Monterey in May, 1848, about three months after California became an acknowledged part of the United States.

The pony express, a private enterprise, was established between St. Joseph, Missouri, and San Francisco, California, in 1860, for the purpose of affording a faster means of transportation of mail to and from the Pacific coast. It took 75 ponies and 10½ days to make the first trip to the coast. The fastest trip was that made to deliver the inaugural address of President Lincoln, and the distance of about 1,400 miles between St. Joseph and Sacramento, California, was covered in 7 days and 17 hours. At first the company charged $5 for each half ounce, but later this was reduced to $1. The difficulties of maintaining the service were enhanced by frequent Indian attacks upon the stations and riders. Buffalo Bill was one of the early pony riders.

The First Postage Stamp

Adhesive stamps for use in the prepayment of postage on mail matter were authorized in 1847 and first placed on sale at New York on July 1 of that year. In the days before postage stamps were authorized it was customary to fold a letter so that the name and address of the addressee

might be written on the outside, envelopes being unknown at that time. The letter was sealed with wax and the postmaster at the office of mailing wrote in the upper right hand corner of the folded letter the rate of postage which might either be paid in advance or collected from the addressee on delivery. The rate of postage was then 6 cents for a letter composed of a single sheet of paper weighing less than one ounce, if it was conveyed not exceeding 30 miles and at a graduated scale up to 25 cents if over 400 miles.

Up to that time it had been aimed to make the postal system pay its own way by balancing expenditures with receipts, but Congress in 1851 recognized the post office as a vital important public service and adopted the policy of "service first." This policy has been extended down through the years until now we have the greatest business institution and public utility in the world, not for money-making but for public service.

In the early days there was little need for speed, as transportation was limited and the postal requirements of the people were few and easily met. Under Franklin a force of a few hundred persons served the mail to our 3,000,000 inhabitants, while today there are 45,000 post offices. The postal service is the largest employer of labor, representing nearly one-half of all Government employees, and larger, of course, than any single industrial enterprise in the world. In volume, the United States mail has grown from a small beginning to an estimated grand total of 25,800,000,000 pieces per annum. This includes parcel post as well as letters, and the total estimated weight of this enormous volume of mail is 5,500,000,000 pounds.

The postal service maintains a huge motor fleet of more than 8,000 vehicles. It operates through every known means of transportation, from horseback and dog sled to airplanes.

The next step in the extension of the postal system was the establishment of the Money Order system in 1864. It is interesting to note that the system was adopted during the third year of the Civil War as a means of accommodating soldiers who were desirous of sending money to their homes, although the establishment of the service had been advocated strongly for many years both in Congress and by the public. This service was placed in operation at 193 post offices, and the popularity of this branch of the postal service from its inception is best attested by its rapid growth. At the present time money orders having a gross value of more than $2,000,000,000 are issued every year.

In an effort to enable patrons of the Post Office Department to secure special and prompt delivery of letters, the Special Delivery service was established in 1885, and this unit of the service which handled a million letters in the first year of its existence has grown to a point where it now handles some 88,000,000 letters per annum.

The Rural Free Delivery service was instituted in 1896 when three routes were placed in operation in West Virginia. This service is now one of the very vital branches of the entire postal system in this country, serving some 25,000,000 patrons daily. The present Rural Delivery service comprises some 33,000 carriers who cover more than 1,000,000 miles daily.

After many years of discussion, the Postal Savings system was inaugurated in 1911, and by 1917 it had grown to such an extent that there were more than 500,000 depositors with deposits of more than $80,000,000. Even this figure is paled into insignificance when we consider that today the Postal Savings system has on deposit more than $1,250,000,000 representing some 2,700,000 depositors. Originally, $500 was fixed as the maximum that could be placed in a postal savings account, but this was later increased to the present $2,500 limit.

The domestic Parcel Post system was established in 1913. It has been rightfully stated that it was this service that brought the city to the country and the country to the city, by enabling rural residents to purchase their goods in the industrial centers by mail while they themselves were afforded the opportunity of shipping their own products to the city by means of the parcel post. The Parcel Post system today ranks as one of the chief sources of revenue of the postal system, ranking second only to first-class mail matter.

The Dead Letter Office was established in 1825 although no records of its operation were kept until 1900 when Congress passed a resolution requesting information on the dead-letter service. The information thus obtained revealed that there were more more than 2,000,000 undeliverable letters being received every year. At the present time every first-class post office is utilized as a dead-letter office and there are 14 dead parcel post branches throughout the country. Between 10 and 15 million dead letters are received annually at the present time, and the amount of money found therein every year amounts to more than $100,000.

The Air Mail

One of the greatest developments in mail transportation was the establishment of the domestic

Air Mail system in 1918. One of the most dramatic and romantic of all branches of the postal service, the Air Mail service has revolutionized the transportation of mail over long distances at high speeds.

Owing to its being a strictly modern development and one which is of vital interest to every person interested in the postal service at the present time, there is related in the following paragraph a comprehensive history of the United States Air Mail Service.

The United States Air Mail Service, which may rightfully be termed the pulse of our commercial air transport system, has grown from the 218-mile single route established by the Post Office Department between Washington and New York on May 15, 1918, to a comprehensive Nationwide and transoceanic system embracing some 65,000 route miles and 70,000,000 annual flown miles.

It is possible to comprehend the magnitude of the postal service when we stop to consider that postal revenues for the past fiscal year amounted to $765,000,000. This vast volume of business is carried on with a combined force of 378,000 employees in all branches of the service.

The Post Office Department maintains its own fleet of more than 8,000 motor trucks. It transports mail by every known means of transportation from the underground pneumatic mail tubes of the largest cities to the giant airliners which wing their way across the continent every hour of the day and night.

Departmental Functions

The Post Office Department is directed entirely from Department headquarters in Washington where a staff of some 1,100 employees handle the most minute details of the many and varied operations of this great public utility. Reports on every single transaction in the respective post offices are received and checked by this staff which is under the direction of the Postmaster General and the four Assistant Postmasters General.

The executive duties are classified and carried out by the bureaus of the respective Assistant Postmasters General. For example, the first Assistant Postmaster General handles all service and personnel matters, including postmasters appointments.

Under the Second Assistant Postmaster General come such functions as the division of air mail, international mail service, and all forms of transportation operations, including railroad mail service, and rural and star routes. The only transportation unit which does not come under the Second Assistant Postmaster General is that of the

motor vehicle service which is operated under the Bureau of the Fourth Assistant Postmaster General.

The Third Assistant Postmaster General is in charge of all fiscal affairs of the Department, including postal savings, money order and registry service as well as the divisions of stamps and classification.

All postal purchases, the selection of sites for new post office buildings, the maintenance of all post office buildings and operation of the motor vehicle service and division of topography come under the jurisdiction of the Fourth Assistant Postmaster General.

In addition to the Postmaster General and the four Assistant Postmasters General, there is the Chief Post Office Inspector who heads the organization of some 550 postal inspectors. These act as the eyes and ears of the service throughout the country, working in co-operation with the postmasters, who have complete authority over their respective offices. Then there is the Solicitor for the Post Office Department under whom is a legal staff, which handles all legal matters pertaining to the service, including the handling of cases involving illegal uses of the mails by swindles, lottery operators, purveyors of obscene matter, etc.

Every American should be proud of the Post Office Department and the service that it is rendering, for it is the one department of the Federal government which provides a direct link with every man, woman and child in the United States.

Pastures Out-Yield Corn

BUTLER county improved pastures are competing with corn silage in producing tons per acre of green feed at one-tenth the cost, and the protein content of the dried grasses is over 24 per cent, says R. H. McDougall, county agent.

The yields secured this summer by making clippings located in six limed and fertilized pastures average 15¼ tons of green grass, which compares favorably with the usual yields of 12 tons of corn silage per acre.

The unimproved portions of these pastures produced less than one-fifth the green weight and four-sevenths of the dry weight, which analyzed one-half the protein of the treated areas. The average of three untreated pasture plots for which figures are available is 5,823 pounds green weight and 1,966 pounds dry matter per acre.

—Pennsylvania Farmer

Can We Guarantee Vitamins in Eggs?

Condensed from The Poultry Item

Byron H. Thomas and W. Windsor Cravens

THE consumer of eggs has been educated to judge their quality largely by appearance, flavor and odor. The factors which the grader emphasizes principally are: structure of shell, freedom from blood and meat spots, and lightly or highly colored yolks (which may be due either to feeds or quality and condition of the white). Consideration may also be given to color of shell, size and shape, and flavor.

In such grading, consideration is given only indirectly to the nutritive value of eggs. Though we may not realize it, we eat eggs very largely because of their food value. Eggs contain an abundance of protein of excellent quality, fat and carbohydrates for energy, phosphorus and calcium for bone development, iron and copper for blood formation and many of the vitamins essential for growth and well-being. These are the principal resaons why eggs frequently are prescribed for patients and are included regularly in the diet of infants and children. However, several of the vitamins occur in eggs in highly variable quantities. This variability is influenced markedly by the nutritive quality of the hen's ration. Particularly is this true of vitamins A, D, E, and flavin.

The time has arrived for poultrymen to give serious consideration to the possibility of including certain nutritional values in the grading of eggs.

Easy to Step Up Vitamin D

Sunshine, or its ultra-violet light equivalent, or feed, largely determine the amount of vitamin D occurring in eggs. Hens having access to summer range have produced eggs ten times more potent in this vitamin than those laid by birds confined indoors. Similarly, hens directly irradiated with ultra-violet rays have produced eggs 20 times more potent. However, hens receiving rations fortified with two per cent codliver oil have produced eggs only five times more potent, but when fed a ration fortified enormously with a concentrate of codliver oil, have produced eggs 200 times more potent than the eggs of birds restricted to unfortified rations. Similarly, enormous dosages of Vitamin D as irradiated ergosterol have been effective in increasing the vitamin D activity of eggs 4500 times that found in the eggs of hens which had not

received any of this vitamin in the ration. These comparisons indicate that it is relatively easy to increase greatly the vitamin D activity of eggs. Furthermore, it is apparent that this can be accomplished most readily by fortifying the ration. Yet there are no data known to us which appraise the various factors operative in the production of eggs uniformly rich in vitamin D. Below we are summarizing briefly the results of our study of certain of these factors.

Report on Experiment

Three uniform groups (A, B, and C) of twelve White Leghorn pullets each, formed the basis of this phase of the experiment. For six months these birds were confined individually to a laying battery located in a well-ventilated basement room from which all sunlight was excluded. During this time all three groups received a basal all-mash laying ration composed of the following ingredients in the proportions indicated: ground yellow corn No. 2, 30 lbs., ground oats, 20; ground wheat, 20; wheat bran, 6; alfalfa meal, 3; flour middlings, 7.5; skimmilk powder, 2; meat and bone meal, 6.5; salt, 1; steamed bone meal, 1; ground oyster shell, 3; total, 100. In addition, water, oyster shell and grit were supplied *ad libitum*. The check group A received only the basal ration. The yeast group B received in addition one percent, and the codliver oil group C one-eighth percent of irradiated yeast and codliver oil respectively. Each pound of the yeast and codliver oil rations contained 30,000 and 2,000 units (U.S.P.) of vitamin D, respectively Daily records were kept of feed consumption and egg production of each bird. All eggs were dated, weighed and stored at 32°F., until tested for vitamin D by acceptable procedure. All birds were weighed weekly.

Rapid Increase in "D"

The eggs laid before the rations were fortified assayed only 12 units (U.S.P.) of vitamin D per yolk of 15 grams. After the basal ration had been fortified with codliver oil and irradiated yeast, yolks of comparable size assayed 30 and 400 units, respectively. As soon as the basal ration was fortified with the irradiated yeast, the vitamin D content of the yolks increased rapidly. This is demonstrated by the data presented in Table 1. By the 3rd, 7th, 14th and 21st days of supplementation, the vitamin D activity had increased to 100, 240, 330 and 400 units per yolk.

It was beyond the scope of our rat laboratory to assay each egg for vitamin D. Instead eggs laid immediately following a pause, in the middle, and toward the end of each laying cycle were assayed. By following this procedure, 37 eggs laid by nine hens which received the yeast ration were col-

lected and assayed. An average of four eggs was assayed for each bird. The pause which preceded the collection of the first egg of each cycle ranged from 8 to 26 days. The eggs selected for assay ranged from the first to the 59th laid during the production cycles, and the rate of egg production to time of egg selected, varied between 9 and 60 per cent. Thus eggs were collected for assay from hens that had laid at markedly different rates and at different times during each cycle of egg production. By subjecting these data to statistical treatment (analysis of variance and covariance) it was possible to measure the effect of any one condition or combination of conditions on the vitamin D potency per unit weight of yolk. Unless otherwise indicated, comparisons are based on equal weights of yolk, since all the vitamin D of an egg is found in the yolk.

Transfer From Feed to Egg

All of the eggs selected from each hen in the yeast group were tested for significant differences in vitamin D potency. Only one hen produced yolks significantly different from the others in vitamin activity. We had anticipated that yolks laid by the same hen would be quite alike in activity. Possibly the yolks from the various hens differed markedly in this respect. An analysis of these data failed to reveal any significant difference between the vitamin activity of yolks from different hens. It has been pointed out that the quantity of vitamin D supplement incorporated in the ration markedly affects the vitamin D content of the eggs. Also, it is known that hens consume variable amounts of the same ration day by day. Whether the total amounts consumed during each period of ten days required for the rapid formation of a yolk are sufficiently different to produce significant differences in the vitamin potency of eggs laid by the yeast group was determined next. Apparently the differences in total feed intake during these periods of ten days are too small and variable to affect significantly the vitamin D potency of the yolks laid by the yeast group. The hens mechanism of transfer of vitamin D from highly fortified rations to yolk appears to be relatively non-sensitive to normal variations in feed consumption.

In our selection of these eggs for vitamin assay we might have accidentally chosen only those which differed insignificantly in vitamin activity. To eliminate the effect of any such error therefore, we compared the vitamin D activity of the first egg laid after the pause, with that of eggs laid either near or at the end of the laying cycles. A test of significance of the data obtained from these eggs should reveal the maximum variation in vitamin potency, yet an analysis of these

data failed again to show significant differences in vitamin activity. Nor was any significant relationship found between the total weight of each yolk and the vitamin potency per unit weight of yolk. Practically, each gram of egg yolk in eggs laid by hens consuming the highly fortified all-mash ration contained essentially the same number of vitamin D units regardless of the size of yolk.

Apparently differences in (a) egg production, (b) position of the egg in the cycle or (c) food consumption by a hen or between hens receiving an all-mash ration highly fortified with vitamin D in the form of irradiated yeast are irrelevant factors in the production of eggs uniformly rich in vitamin D. However, there is a significant relationship between size of yolk or egg and total vitamin activity. The larger eggs contain proportionately more total vitamin activity than smaller ones. Since egg size is highly variable, it would constitute the main prerequisite to be considered in the marketing of eggs uniformly rich in vitamin D. This requirement should be simple to adhere to and control since market eggs are regularly graded for size within narrow limits.

Meeting Human Requirements

Thus it appears from the data at hand that commercial poultrymen can produce eggs within reasonable limits of activity, guaranteed uniformly rich in vitamin D, simply by following a pre-determined program of feeding and subsequent grading of eggs.

It has been shown that each infant and child requires approximately 400 units (U.S.P.) of vitamin D per day to promote normal growth and calcification of bone. It has been recommended that they receive this unitage every day regardless of the season of year. The pullets receiving the irradiated yeast ration produced 18 to 20 ounce eggs (per dozen) which averaged approximately 400 units (U.S.P.) per egg throughout our experiment. This was accomplished without affecting adversely either their rate of egg production or health.

One is not limited necessarily to the feeding of irradiated yeast to attain such results. It also should be possible to produce eggs uniformly enriched in vitamin D by fortifying the ration with any of several highly potent concentrates of vitamin D. However, the advantages and disadvantages of each must ultimately be determined largely by experimentation.

Instead of continuing to grade eggs only on first appeal, poultrymen should consider the possibility of guaranteeing certain of the nutrients essential to growth and the maintenance of health. Milk producers have recognized that milk is notably deficient in vitamin D. Scientific discoveries

have made it possible to improve it in this respect. Vitamin D milk containing approximately 400 units per quart instead of only a dozen units is no longer a novelty. In the beginning it was eyed with scepticism by consumers, but now it is accepted quite generally.

The commercialization of the production of eggs having special or augmented vitamin values will depend very largely upon two items, namely, the cost of periodically checking the vitamin potency guaranteed, and the cost of the vitamin D supplement. These items are essential and their cost does not appear to exclude the possibility of commercially producing eggs uniformly enriched in vitamin D.

Whether the commercialization of "Certified Vitamin D Eggs" or "Sunshine Eggs," as they might be called, should be encouraged, is a highly controversial point. In the end the industry probably will decide this issue.

TABLE 1

Rate of Increase of Vitamin D in Yolks of Eggs Laid by Hens Fed An All-Mash Ration Fortified with 30,000 Units (U.S.P.) Per Pound as Irradiated Yeast

Number of days hens received the ration	0	3	7	10	14	17	21	28	35	42
Vitamin unitage (U.S.P.) per yolk of 15 grams	12	100	240	280	330	370	400	390	390	400
Percentage of maximum vitamin activity	3	25	60	70	93	93	100	98	98	100

Can Not Deceive Pig about Water in Corn

Condensed from The Hog Breeder

PIGS may have cosmopolitan food habits but they are connoisseurs of corn and have a distinct dislike for corn high in moisture. If permitted free choice, they will avoid wet corn and eat that with low moisture content almost exclusively.

In an experiment at the Ohio Experiment Station, pigs weighing 60 pounds were permitted to choose from feeders any one of eight lots of corn which varied in moisture content from a low of 16.2 per cent to a high of 20.8 per cent. The actual pounds of each corn eaten then were reduced to a 15.5 per cent moisture basis to permit comparison of the nutrients consumed.

When about 20 bushels of each lot of corn were eaten, that lot was removed from the feeders to compel the pigs to choose from those remaining. Twenty bushels of the driest corn were eaten in the period from January 4 to February 2, and the rate of consumption for each lot was in inverse ratio to its moisture content.

The amounts eaten of each lot of corn each week prove that the pigs immediately detected the removal of their first choice corn and increased their consumption from the lot which then had the lowest moisture content. The pigs ate only 115 pounds of second-choice corn in seven weeks that a drier corn was available. When that was taken from the feeders, the pigs ate 1,171 pounds of what was originally second-choice corn in the next seven weeks.

The pigs consumed a combined total of only 648 pounds from lots seven and eight in 18 weeks while corn from drier lots was in the feeders. When only lots seven and eight were left, the pigs ate 1,554 pounds of the corn containing 20.7 and 20.8 per cent of moisture in three weeks.

W. L. Robinson, who conducted the experiment, changed the positions of the various lots of corn in the feeders to make sure the pigs did not choose certain positions at the feeders instead of certain lots of corn. The pigs had no difficulty in locating the corn they preferred each time it was moved.

The Ohio experiment indicates that some factor which is present in corn with a high moisture content makes such grain unpalatable to hogs. The animals distaste is so pronounced it appears probable a small difference in moisture content may make a considerable difference in the value of two lots of corn for hog feed.

Duck Farming

Condensed from New England Homestead

G. T. Klein

DUCK raising is the most highly specialized of the several branches of the poultry industry of Massachusetts. The 600,000 ducks that are raised here annually are in the hands of not more than 15 or 20 individuals. There are the exceptions however—a very few ducks grown here and there for show or for the home table but these total but a small number. The state claims New England's largest farms with two producing over 120,000 ducks annually and several farms producing 50,000. The state ranks about seventh in production in the United States. So specialized has it become and so large are the units that new comers hardly dare venture into it.

Early in the winter breeders begin to produce eggs. These are laid in the very early morning and by daylight, or shortly after, the lay is over. Nests are very low and placed at ground height and filled with shavings for litter. Breeders are usually confined to the house until all eggs have been laid and then turned out to range and the freedom of a pond or stream. Production is intense during spring months with practically 100% lay on many days. The egg yield from an individual is expected to be about 120 eggs during the breeding season.

But few breeding ducks are carried over into the second year. These few are selected from the best of the flock. The baby ducks are practically always started in a long brooder house equipped with a hot water heating system. The units brood about 100 to 150 and soon they outgrow these early brooding quarters and must be moved on to more spacious houses. The starting temperature is around 90° and is dropped to 75° after the second week when they are moved to a cooler and larger brooder house. By the time the ducklings are six weeks old they have been moved three or four times and are then in the fattening yards.

The starting feed used almost universally in Massachusetts is the pellet. They seem large for so small a bird as the baby duckling at hatching time, but they are readily eaten. The consumption of the pelleted feed is high as this may be eaten without an excessive quantity of water that is required with dry mash. The rate of growth is greater on the pellets

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than is attained with any other method.

The pellets are fed start to finish on some of the farms. However, growers are not in agreement as to the relative profitableness of pellets and wet mash during the growing and fattening periods. The feed consumption is large in comparison with poultry and on most of the farms a home mixture is used during the fattening period. This feed is high in corn meal, bran, flour, oatmeal and most fattening feeds carry at least 10% green feed chopped up and mixed with the wet mash. The period of heaviest feed consumption is when they are about six weeks old.

The fattening of the duck starts at about six weeks of age. They are moved from the long brooder houses where they have some heat, to the cold houses at this age. The pens have gravel surfaces and practically always include some water. The water is not considered an absolute necessity in duck raising, but it is desirable. If they have the water after they are well feathered they are smoother and whiter and possibly their growth is greater.

The killing age today is practically always nine weeks. The average weight reached at nine weeks is about six pounds. There are some individuals that will attain weights of nine pounds in this span of nine short weeks. It requires from four to four and one half pounds of feed to make a pound of duck (dressed weight) at market age.

Dry picking of ducks has long been practiced in Massachusetts. The English picking machine is now in rather common use here. This is a mechanical picker for removing the large feathers from the body. These feathers are conveyed to a room where they are held for drying and storage until sold. The feathers are quite a profitable part of the duck industry.

After the roughing of the duck with the picking machine it is finished by hand. Many of the remaining feathers are removed with ordinary rubber heels with which the picker rubs off the feathers. The final clean-up is made by shaving with a straight edge razor. In some sections the ducks are scalded and the pin feathers are completely removed rather than cut off with a razor. Most of the dressing is paid by piece work and pickers make fair wages.

The head, feet and wings are left on the dressed duck. With a printed ribbon carrying the farm name and "Bay State Duckling" the carcass is neatly tied with head and wings on the back. It is cooled in ice water and graded according to quality. In transporting to market the ducks are packed in special boxes and iced.

Soybeans for Lambs

Condensed from Sheep Breeder

ALTHOUGH soybeans will produce "soft pork" if fed to fattening hogs, they are a desirable feed for lambs and will not effect the quality of the carcass, reports Dr. John E. Foster, associate professor of the North Carolina State College Animal Husbandry Department. "In fact," he said, "we have found in our experimental work on the State College farm that ewes and lambs gain faster on soybean pasture than on any other kind."

With soybean production up nearly 10 times what it was 10 years ago, both farmers and scientists are looking for new and profitable uses for this soil-improving crop.

"We have fed up to three-fourths of a pound of soybeans per day to sheep with good results," Dr. Foster stated. "Soybean oil meal is an excellent protein supplement for sheep, cattle, and even swine. It is the whole beans fed to hogs after they reach 75 to 100 pounds in weight that produce 'soft and oily pork' which is undesirable."

Dr. Foster cited results of experiments conducted by the U. S. Department of Agriculture at the Agricultural Research Center, Beltsville, Md., to support the investigations of the State College Experiment Station.

Three lots of lambs were fed at Beltsville. One group received the usual ration of cracked corn, cottonseed meal, and alfalfa hay. The second lot received only cracked soybeans and alfalfa hay. The third lot received a ration of equal parts of cracked soybeans and cracked corn, with alfalfa hay.

Lambs in each lot averaged more than a third of a pound a day in gain while on feed. Most lamb feeders are satisfied with this daily gain.

Livestock Judging

Julius E. Nordby, M.S. Agr., and W. Malcolm Beeson, Ph.D.

THE element of success in the production of livestock depends in a large measure on the ability to know and select animals that are good feeders and breeders. Also success depends on the ability to recognize merit in breeding animals, and to understand values when buying or selling. The ability to judge is at the basis of success in all of these phases of livestock production.

There are certain characteristics which should be cultivated, if a person expects to excel and be a master of judging livestock.

The desire to know livestock: If you create a potent desire to know livestock and know them well, the battle is half won. You must become livestock-minded and be aware of the perplexing problems that confront the breeder who is selecting and culling to improve his livestock. Allow your mind to dwell on the imperfections as well as the perfections of the breeds of livestock.

A mental image of ideal types: Livestock judging is a subject which involves the comparison of facts. If only one animal is judged or appraised, it is a matter of comparing it with some standard, namely the ideal of its kind. If two or more animals are judged, then each animal must first be compared with the ideal, and then with the others in the class. This procedure precludes the necessity of having definite information relative to the details of type and their influence upon function. The ideal types can be learned by observing good individuals in both the live and picture form. Ideal types of livestock have been set up by a majority of the breed associations. One must be constantly in contact with good animals and observe them keenly. Great value can be obtained from intelligently observing the stock at our leading livestock shows, sales, farms, and ranches. Clearly defined ideals of the various types of livestock come only through constant contact with types that are good representatives of the various breeds.

Keen power of observation: The ability to detect important differences in livestock quickly and accurately must be developed. This keen power of observation is the result of intense application of thought to the outstanding good and bad points of an animal. Persistent practice in

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evaluating livestock in terms of an ideal is a sure way of sharpening your mind to a keen sense of detecting differences.

Ability to make a logical analysis: After all the facts of each animal are assembled in your mind, then comes the problem of wisely and logically placing the class on the basis of sound facts. Since judging is an art based on scientific facts, it is impossible to appraise animals in the terms of exact percentages. It is true that all part of an animal do not have the same economic value, but since each part is interrelated and dependent on the other parts, in the last analysis, the animal must be considered as a whole, rather than as a large number of separate parts.

Observe the animals accurately, weigh the facts in a balanced manner and conclude with a logical placing and your "busts" will be reduced to a minimum. Never follow "silly hunches." Judging is sound reasoning.

The ability to give effective reasons: This ability depends partly on natural talent but primarily on acquired knowledge and practice. A good set of reasons is dependent on (1) accurate observation, (2) a large and effective vocabulary, (3) an orderly system, and (4) the ability to talk in a conversational but yet convincing manner. Train your mind to assemble and retain the outstanding good and bad points about each animal, as compared to your mental ideal. Accuracy is of prime importance.

Giving reasons is, no doubt, the most difficult task for the average person in livestock judging. It requires a large well-selected vocabulary, concentration, detailed accuracy, orderly and logical comparisons, variation in the choice of terms, and courage to give the reasons.

The above is an excerpt from "LIVESTOCK JUDGING HANDBOOK" by Julius E. Nordby, M.S. Agr., and W. Malcolm Beeson, Ph.D. Published by the Interstate Printers and Publishers. $2.60. This book covers the judging of beef cattle, their type and characteristics, judging of draft horses and mules, their breed characteristics, judging of sheep, mutton type, and wool type, and the judging of swine, the lard type, bacon type and breed characteristics. The book is well organized, and the material is extremely well presented. There are many photographs to illustrate the points which the authors bring out most ably. We thoroughly recommend this book to all farmers who wish to improve their herds or flocks. The book was designed for students of agriculture, but may be read and studied with a great deal of profit by anyone handling animals.

Cutting the Cost of Raising Ayrshire Heifers

Condensed from the Ayrsshire Digest

An Interview with Arthur H. Sagendorph, Alta Crest Farms, Spencer, Mass.

THAT the costs of raising Ayrshire heifers, which are too often prohibitively high, may be reduced to a very reasonable figure, without checking in any way the future value of the heifer, is the opinion held by Arthur H. Sagendorph, of Alta Crest Farms, Spencer, Massachusetts.

An inspection of the buildings and a study of the methods used at this well-known establishment indicate that the annual heifer crop is being developed at costs that are probably lower than those that should be charged against the young stock in many instances under general farm conditions.

Fundamentals in the Alta Crest system are freedom and fresh air through the use of open sheds, and with it goes a feeding program that includes the minimum amount of milk, liberal use of preparatory milk substitutes, and an abundance of hay. There is surely nothing complicated, startling or expensive about these methods. In fact, their simplicity may explain why they are not being followed by more breeders.

Open Shed Cuts Labor Costs

One of the most interesting features of the Alta Crest heifer raising plan is the open shed in which the yearling heifers are wintered. This shed, built along similar lines to the beef-feeding plants of the Mid-West is a single story structure with five large pens each about thirty feet square. This shed opens to the south and during the winter of 1938-39 the large doors were never closed. Heifers move freely out and in—and strange as it may seem—even in the coldest weather they spend considerable time out-of-doors, protected by the shed and a nearby grove of trees. This is in spite of the fact that Alta Crest is located in a section of New England in which the winters are quite severe.

This shed was constructed from lumber cut on the farm. The roof is covered with sheet metal. Beneath the earth floor is a fill of about 18 inches of broken rock on which there are several inches of cinders.

The building is 36 feet wide with a feed alley the full length of the north side. A silo is on one end and a hay barn on the other. Pens are 32 feet long, making them about square.

In each pen there is a watering trough with a self-emptying hydrant which prevents freezing.

Reprinted by permission from The Ayrshire Digest, Brandon, Vermont

Feed bunks and hay racks, made of oak, complete the equipment of this simple but modern feeding plant.

Heifers Wintered Without Grain

Ayrshire breeders who worry about costs of raising their yearling heifers may reflect on the fact that Alta Crest heifers (yearlings and older) receive no grain while being wintered in this shed, and that mixed hay was the only feed used last winter. The present group of heifers is receiving a feed of grass silage each day and all the hay they will consume. When asked about feed consumption, Mr. Sagendorph stated that, in his opinion, heifers will eat a great deal more hay when handled in this manner, but he believes that it is still cheaper than to stall feed, particularly when grain is used. It was also pointed out that about three months before their first calving, heifers are taken out of these sheds and prepared for their first lactation by putting them on a fitting ration. No mineral supplements are fed to these growing heifers.

Obviously the labour required in feeding is reduced to just about the least possible amount. But, as Mr. Sagendorph pointed out, there is still another saving in the labor required to remove manure. Instead of this being a daily task in all kinds of weather, it is done just once a year.

Of course, pasture is exclusively depended upon for carrying the growing heifers through the summer at Alta Crest. Here again economy has been practiced by having some of the heifers follow the milking herd on the fertilized pasture plots which play such an important part in Mr. Sagendorph's management methods.

As might be expected, spring calves are not turned to pasture until their second spring, while fall calves that are well started go out their first spring. No supplementary grain is fed to any of these calves on pasture.

Calf Barn Has Interesting Features

But to return to the early days of the Alta Crest calves—before they are ready for pasture. At this time they will be found in a modern calf barn which also embodies the features of fresh air and freedom. Calves are confined to small individual pens for the first few weeks or until they are on dry feed. Individual pens prevent sucking and are of course much more convenient for milk-feeding. After that they are placed in larger pens which open into yards. Throughout the day these doors are open. These pens and yards are cleaned periodically, usually in spring and fall.

The calf barn is one hundred and forty feet long and twenty feet wide, easily having a capacity for 70 calves. It is divided into two sections with dividing partitions, one section being for the

younger calves and the other for older youngsters. In the baby calf section there are 15 individual pens, four feet by six feet, where the babies spend the first four to six weeks of their lives. In this section there are also five pens, nine feet by twelve feet, accommodating five or six calves to the pen. In order to prevent drafts, all pen partitions are made of two inch oak plank, planed and matched on both sides, these planks fitting into channels so that they may be easily removed at any time. The second section is for older calves and contains six pens, twelve feet by sixteen feet, accommodating six or seven calves in each pen. With "Dutch" doors in each pen, the upper section of the door can remain open nearly every day during the winter months.

In order to overcome the necessity of artificial heating, the ceiling is very low, being only seven feet above the floor.

The south side of the building is well supplied with windows which hinge at the bottom and tip back on strong wooden guards. These windows allow the sun to pour in from morning till night. So well has comfort been provided for by this means that there is absolutely no need for artificial heating. The lower windows in all the pens are protected by wire cloth so as to prevent breakage. The north side is unbroken by windows or openings, consequently allowing no possibility of drafts.

Calves are usually taken away from their dams at once, or at least within a day or two, and are taught to drink whole milk. As a rule they do not receive over a gallon per day, at any time.

Dry Feed Basis of Calf Feeding

Mr. Sagendorph and his employees are enthusiastic about Calf Manna, which they have been using for a number of years. They find that by the end of the first week a little Calf Manna is being eaten, and that by the end of the second or third week calves are eating from a half-pound to three-quarters of a pound per day. After the second week whole milk is gradually reduced, and skim milk in limited quantities takes its place, but as a rule, by the end of the fourth or fifth week no milk either skim or whole is being fed. By that time a pound of Calf Manna (costing about 6.2 cents) is being eaten daily. A fundamental of the Alta Crest method is to not feed heavily of either whole or skim milk at any time thus encouraging the consumption of dry feed.

This plan of dry feeding—which requires much less labour than bucket-feeding—is continued as a grain ration, is introduced at three to four months. This consists of 300 pounds crushed oats, 300 pounds of bran, 300 pounds of hominy, and 100 of linseed oil meal. Calf Manna is

still added to the ration until the calves are about five to six months old, after which it is discontinued.

Since Alta Crest ships a great many baby calves to all parts of the United States, this plan of "dry feeding" has been found very useful. Calves will ship in better condition and at an earlier age than when bucket fed, is Mr. Sagendorph's report.

Simplicity and economy are the fundamentals of the Alta Crest heifer raising plan.

Methods of Organizing Artificial Breeding Associations

NATIONAL Dairy Products Corporation has made available to milk producers a detailed description of how artificial insemination associations can be formed by dairy farmers in a pamphlet entitled "Artificial Insemination of Dairy Cows." Organizational methods are described in detail.

The summary emphasizes that an artificial insemination association makes available proven sires (sires capable of increasing milk production of their daughters over their dams) to all members of the association at no higher cost than the keeping of an ordinary unproven bull; eliminates the bother of keeping a bull for breeding purposes in a small herd; reduces the possibility of spreading diseases usually incident to breeding, and stresses that the improved breeding program resulting from the use of better bulls is of benefit and profit to dairying in the whole community where an association is operating.

Shortly after establishment of "Co-operative Artificial Breeding Association No. 1, Inc.," at Clinton, N. J., in May, 1938—the first such organization in the country—Thos. H. McInnerney, president of National Dairy, became interested in the subject. More than a year ago National Dairy provided for two research fellowships at the state colleges of agriculture in New Jersey and Vermont so that further research in the science of breeding through artificial insemination could be carried on at those institutions.

A survey by National Dairy shows that as of 1940 some 5,000 dairy farmers had about 50,000 cows enrolled in 54 artificial breeding associations located in 22 states. New York, Wisconsin, New Jersey and Michigan have the most associations.

Scott County's Unusual 4-H Family

Condensed from The Farmer

Frank J. Clark

IF Jacob Schwingler, back in 1860, when he settled near Jordan in Scott County, Minn., could have looked ahead into the future 80 years, he would have rejoiced at two amazing developments: First, at the growth of the 4-H club movement; and, second, that in the family of his grandson Joseph, now living near the old homstead, he and his children had built to their credit a total of 44 club years.

In this unusual family, there are twelve children, eight of them of club age and all active in one or more club projects. Ever since the oldest twins, Eugene and Eunice, were old enough to become 4-H club members, the family have been 4-H boosters. In this octette are five boys and three girls. The first twins are 17 years old, Doris is 16, the second twins, Allen and Alice 14, Felix 13, Clinton 12, and Emery 10.

During the current year, besides being active in many other projects, all eight children fitted and showed baby beef calves at the Scott County Fair. Allen's calf won the grand championship, Clinton's placed second, and Eugene's third.

Winnings and honors in the county have been numerous.

Eugene has been in club work nine years. His projects have included beef and dairy calves, and colts. In 1940 he won a trip to the state fair as an outstanding club member. He also won a trip to the Junior Livestock Show.

Eunice has been a "clubber" five years, starting with cake baking. The second year in sewing work she was awarded highest county honors. To these projects she added baby beef this year.

Doris has spent six years in the work with bread-making and demonstrations her particular projects, this year adding baby beef. She went to the State Fair in 1937 and again in 1940 as individual bread demonstrator. In 1939, she won a trip to South St. Paul with her baby beef.

Allen has five club years to his credit, being active in dairy and beef calves, colt, and pig. He has won two trips to the Junior Show, in 1938 with his pig and this year with his baby beef.

Alice has also been in club work five years, devoting her time to cake making, meal planning, clothing, and baby beef.

Reprinted by permission from The Farmer, F. S. & H., St. Paul, Minn., Oct. 19, 1940

Felix is finishing his third year. He has been a busy boy with dairy and beef calves, and pigs. In his second year he won a trip to South St. Paul with his calf, but was too young to go.

Clinton has spent both of his two years with baby beef. His second place in the county this year won for him a trip to the Junior Show.

Emery, in his first year, continues to reflect the fine family spirit. He made this pertinent comment: "A boy or girl surely can get a lot of fun and experience in club work. I did not place with my baby beef, but enjoyed it all just the same."

In visiting with these children, one is impressed with their fine co-operative effort in all their club projects. The older ones with longer experience more fully realize the benefits received.

Achievements such as these do not come by accident or without effort. Back of it all is the parents' abiding faith in the 4-H program. They have made the various projects a part of the regular farm and home work and, conversely, much of the work done is part of a 4-H project.

"In observing outstanding young men and women in my community," said Mr. Schwingler, "almost invariably, after looking into their past life, we find that they have been former club members now making better homes, better communities, and a better country to live in.

"As far as my family is concerned, 4-H work is doing its share in uplifting the moral, educational, and social standards. Much credit is due Wallace Miller, county agent, and his assistant leaders for the success of club work in Scott County."

Another incentive that these children have had and which Mr. Schwingler mostly passes over needs special emphasis. To keep the children pepped up and interested, he said, "they of course, have all the profits from their projects after expenses are paid. The old saying, 'Johnnie's pig and papa's hog' will not do much to keep up interest."

The Schwingler family has set a fine standard and made an enviable record. In the years ahead, a safe prediction is that it will become a 12-member family with correspondingly greater achievements.

Mule Day in Middle Tennessee

Condensed from The Horse

Fayola Payne

COLUMBIA, Tennessee, is famous for Mule Day. The first Monday in April is set aside for this annual celebration. Here the mule plays the role of a free and fancy show animal instead of a dumb brute used only for drayage and hard work. He is King for a Day and parades as high class stock with onlookers seeming to forget that he is a hybrid.

This all-day affair arouses the interest of thousands of people from country wide. The town is thrown open to traders and visitors from everywhere. The crowning of the mule works up to a finale of rare and spectacular interest. This sale is more than a mule sale. It is a gala event and attracts people of every line of business.

Celebrities from coast to coast as well as home folks from surrounding communities come to Columbia for Mule Day. Newspaper and magazine representatives from all parts of the country attend this street mule sale. Radio broadcasts carry the news of the happenings of the day to those who are unable to be there, and news reels are made so that these unusual pictures may be shown on the screen.

This celebration has the make-up of a carnival. Strings of fried fish, fried chicken, and barbecue sandwiches are sold on the streets. Fiddlers and banjo pickers strike up a tune at intervals.

Buyers walk amidst the shod feet with walking sticks and eyes of appraisal. The stamping of horses' feet and the long, loud braying of mules fill the air with a noise much like the barnyard.

Horses are classed and shown in ring performance with prizes given to the best of the breed, and mules are shown in competition with other mules of their style.

Mules, ponies, and horses are geared to decorated floats and a cavalcade of speed wagons, two-horse wagons, buggies, surreys and carts follow the King mule to his coronation. Girls ride on big long-eared mules through the streets from time to time all day long. Pageants of educational value are portrayed, and prizes for the best floats and bands are awarded.

Barns, warehouses, and dance halls are opened for dancing. Everybody is allowed to join in the jubilee. New dances have been originated here. The Mule Trot made its debut as a dance

Reproduced by permission from The Horse, Otis Building, Washington, D. C.

in Columbia on Mule Day in 1939.

Columbia was a post for trading mules many years ago when swapping and buying was the only method of trading, or outlet for livestock sales, and this celebration on Mule Day dates back for more than a hundred years. This kind of sale lasted until after the world war. The war brought prosperity. Mechanical inventions almost banished mules from Middle Tennessee. People had an idea that mules were consumers. Jennetts were given away, and Jacks were sold for practically nothing. Mules, the cross of a mare and a Jack, seemed to have no place in the land. Still the first Monday in April remained a day of swapping and trading for the citizens of Columbia. Potatoes, and seed wheat, or such commodities were brought to this center to trade. And whether farmers had anything to sell or not they couldn't rid themselves of the desire to go to Columbia on Mule Day. Even then fiddlers would bring their string instruments, and home talent shows for the benefit of neighbors and relatives went on as usual. But few mules were seen. People were moving at a fast gait, too fast for the slow mule, it seemed. Then came the crash, followed by the depression. Everyone was giving more thought to the value of property. Farmers must produce more at less cost. They must use feed that couldn't be sold, to a good advantage. And again mules come to the front as power at cheaper rates. Once more breeders spent much time in the careful breeding of mules. This stock of such great endurance was in demand. Good Jacks began bringing high prices. With this, Columbia's Mule Day became alive again, and the Mule was King in the South.

Since the revival of Mule Day eight years ago, Columbia has grown to the largest street mule market in Tennessee, and perhaps in the world. Mule Day has become a nationally known event. Stock traders, dealers, and breeders from every agricultural State in the Union attend the sale. Other than farmers, and those attending the sale for buying and selling reasons, many join the gathering just for the celebration that takes place. Young and old parade the streets on foot, or mule back. Each year this rally has brought a larger number of people to Columbia. In 1940 the number had grown to more than 35,000, and 5,000 or more mules and horses were paraded on the Court Square.

Of recent development of interest to mule breeders is the Middle Tennessee Experiment Station at Columbia, where one of the two Jack and Jennet Breeding Farms in America is stationed.

An amazing fact that may be of interest also is the miniature

mule. Lex Watson, a Columbia resident, got this little mule by the cross-breeding of a Shetland pony and a very small Jack. When grown they stand about twenty-six inches and weigh about thirty pounds. This strain may prove valuable for circus use.

Salvaged Damaged Hay

LIGHTNING won't cause a fire twice in the same place on the farm of R. C. Chase, Hansford county, Texas. Several weeks ago lightning struck and set on fire a large stack of new barley hay that Mr. Chase had just completed baling and stacking. With the aid of a bucket brigade formed by 25 neighbors, the fire was extinguished, leaving the hay thoroughly soaked and partly toasted.

In order to save the feed, Mr. Chase enlarged an old trench silo, purchased a new silage cutter and started the soggy hay into the trench.

To insure a better feed, 5,500 bundles of heavy oats were mixed with the barley hay as it went into the silo. Drainage being no problem, a large stream of water was shot into the blower with the feed.

Mr. Chase, instead of having a heavy loss now has 60 tons of good barley and oat ensilage, stored beyond the reach of lightning, fires or other hazards.

—*Capper's Farmer*

Pruning Peach Trees for Heavy Early Production

Condensed from American Fruit Grower

A. M. Musser

The Clemson (S. C.) Agricultural College

THE peach grower must get heavy production from his trees if he expects to make a profit.

At the present time American fruit growers have almost no export market for any kind of fruit. This creates greater competition in our domestic markets between the various fruits grown in this country, and if the total amount of fruit grown at the present time is to be sold in this country at a profit to the grower it means that costs of production must be decreased. By increasing the yield per tree, the cost per bushel is reduced. For instance, if it is possible for a grower to increase the yield per tree by 25 per cent, fewer trees and fewer acres will be needed to produce the same total yield.

Under conditions in many orchards there is probably more opportunity to increase the yield of young trees than of trees in full bearing. It is quite probable that very few growers have picked more than one bushel per tree the third summer, and that not a very large number have picked even a bushel per tree at that age. Such yields would be obtained from trees which had made two seasons' growth and were in their third season when the first crop was borne. Yields as mentioned above have been made, are being made and can be made.

There are a number of reasons for low individual tree or individual orchard yields, viz., inefficient control of insects and diseases, unsatisfactory soil conditions, growing the wrong variety, frosty sites, careless harvesting and picking methods which reduce the percentage of No. 1 fruit, too severe pruning of young trees, etc. The latter reason, that of severe pruning, is the cause of low production in too many orchards where the pruning has been so heavy that the trees have been practically reduced to a trunk with a few stubs each of the first two winters. The reasons advanced by many growers for this severe type of young tree prun-

Reprinted by permission from the American Fruit Grower, Dec., 1940, Cleveland, Ohio

ing are that (1) such pruning "produces thicker trunks" and (2) "makes the trees stronger, more vigorous and better able to produce heavier crops in future years." However, what actually happens is that these trees which are severely pruned have trunks of smaller diameter than trees which are only lightly pruned at the end of the first and second years' growth.

One of the ways to decrease the cost of producing peaches by obtaining increased yields is to bring the trees into heavy bearing at as early an age as possible. Every grower knows that it is impossible to produce a large number of fruits on a small tree, yet when one and two-year-old trees are severely pruned, these trees at the beginning of their third season of growth are too small to support more than a few fruits. Since commercial orchards are planted for the purpose of making a profit, it is necessary for the owner to begin making a profit as soon as possible, and one way to bring a peach tree into heavy bearing the third summer is to prune the tree the first and second winters as little as possible.

Suppose we investigate the reasons given by growers for pruning trees so heavily the first and second winters. All food from which every part of the tree is made is manufactured by the leaves. Obviously, the more leaves on a tree the more food is manufactured in any one season and, the more food that is manufactured, the more growth is made.

There are two general phases of plant growth: (1) vegetative and (2) reproductive. In the peach tree, after fruiting begins, these two phases of growth overlap to some extent depending somewhat upon the variety. For example, the Mayflower variety usually ripens its fruit before top growth has ceased and even before the fruit buds for next year's crop have been formed. In comparison, a late variety like Lizzie (ripening 10 days to two weeks after Elberta) does not mature its fruit until after top growth has stopped and many fruit buds have already been formed. Thus, the food manufactured by the leaves is used for the development of different tissues at different times during each season.

In general, for some weeks following the initiation of growth in spring the vegetative phase is dominant. New branches and new leaves are formed and the top of the tree is growing rapidly. Most of the food manufactured by the leaves is being used for vegetative growth and very little growth is occurring in the root system, in thickening the trunk and branches or stored for next season's growth. However, after top growth stops, reproduction is dominant. The leaves continue

manufacturing food which from then on is used for root growth, formation of vegetative and fruit buds, growth in thickness of trunk and branches and for storage in various tissues to await the beginning of another season. Each vegetative bud is potentially several leaves or a branch which will bear a number of leaves depending upon the length of growth made. Each fruit bud is a single potential fruit.

When young trees are pruned so severely that only a small number of growing points (vegetative buds) remain, such trees will have a lesser number of leaves full grown shortly after the beginning of growth in the spring and the average life of these leaves will be shorter than a tree which has a large number of growing points. For example, a tree which begins a season with 2500 growing points will have a great many more leaves full grown early that season than will a tree which begins the season with 250 growing points.

It also follows that leaves which are not formed and do not reach full size until the middle of the summer or sometime in July have a shorter active life and manufacture less plant food and are therefore of less value to the trees than the leaves which reach full size early in the growing season.

As stated above, it is largely during the latter half of the season that the food manufactured by the leaves is used for adding new tissue to the trunk and branches. Young trees pruned severely often continue vegetative growth later in the season than trees pruned lightly. Such severely pruned trees use more of the manufactured food in making top vegetative growth and only a small portion is used for increasing thickness of the trunk and branches because there are fewer leaves per tree and because there is a shorter time between cessation of vegetative growth and leaf fall.

Pruning young trees has both an invigorating and dwarfing effect, but the final effect of heavy pruning upon young trees is dwarfing. It is often assumed that trees which have been severely pruned are making more vigorous growth and a greater total growth than trees which were only lightly pruned, but if measurements are made it will be found that the severely pruned trees only *seem* to be making more vigorous growth. The severely pruned trees begin with fewer growing points in the spring and since the root system has not been decreased by pruning as has the top, more moisture and soil nutrients are available for each growing point and hence each one of this smaller number of growing points makes longer growth. As a rule, the growth from this smaller number of grow-

ing points is fairly close together and produces a dense tree which also necessitates a greater amount of pruning the following winter than if the growth was more spreading as would result from trees less severely pruned.

In the spring of 1939 an 11-acre orchard was planted at Clemson College for the purpose of conducting soil erosion and cover crop experiments on land that had grown cotton, corn, and oats for many years. This soil had not been highly fertilized and was in a rather poor state of fertility. In the summers of 1939 and 1940 summer cover crops were grown between the trees, allowing sufficient space for cultivation on two sides of the trees. Winter cover crops were grown last winter. All three of these cover crops were fertilized with 200 pounds of superphosphate and 50 pounds of muriate of potash per acre. In addition, the trees received one-half pound of sodium nitrate in 1939 and one pound in 1940, each made in two applications.

The following measurements of the thickness of the trunk and the number of fruit and vegetative buds on these two-year-old trees should be of much interest. For example, one tree of the Lizzie variety has a trunk 2.46 inches in diameter. The branches have a spread of eight and one-half feet while the top is six feet in height. Surely a trunk of this diameter is sufficiently large to support the top. But the large number of buds on this tree is just as important. This fall 871 fruit buds and 1872 vegetative buds were removed when this tree was lightly pruned. There remained on the tree 1123 fruit buds and 2224 vegetative buds.

From these figures it would appear that half the wood had been removed from the top, but this is far from the case, since a considerable amount of the wood removed was from the center of the tree. This latter wood was fairly thin in diameter but contained one or two fruit buds at every node, in addition to a leaf bud. Some of the laterals which were removed in the thinning process also bore a great many buds of each kind. No heavy wood was removed. The terminals of the main branches were headed back to a lateral growing away from the center of the tree. Many of the long unbranched laterals were headed back, the amount of heading depending upon their length and diameter, generally one-fourth to one-third, and practically all the lower branches were left on the tree. Of course, in some cases some of these lower branches were so low that they had to be shortened or removed entirely.

Now suppose this tree was severely pruned, how many buds would remain? Only 95 fruit buds and 143 vegetative buds!

You can readily imagine how little fruit would now be obtained from this tree compared to the amount resulting from light pruning. As stated above, we have left after light pruning 1123 fruit buds. The size of the top is large enough to hold up at least one and one-half bushels of peaches. Certainly we have sufficient fruit buds to produce one and one-half bushels, counting from 200 to 250 peaches per bushel. With a tree of this size and strength, it would be poor management to cut the top back to 95 fruit buds and 143 vegetative buds.

An Elberta tree of the same age has a trunk 2.22 inches in diameter, a branch spread of seven feet and a total tree height of five and one-half feet. With 680 fruit buds and 837 vegetative buds removed by light pruning, 957 fruit buds and 1475 vegetative buds or growing points were left. Following severe pruning only 104 fruit buds and 238 vegetative buds remained. In other words, severe pruning removed from this one tree 1461 fruit buds and 2074 vegetative buds. This tree, before severe pruning, was sufficiently strong to hold up and grow to maturity at least one bushel of fruit (the third season) and with the large number of growing points remaining after a light pruning, sufficient vegetative growth could have been made the same season to enable it to hold up and mature around three bushels of fruit the fourth season. These figures show what is happening in many orchards and what can happen if severe pruning is not practiced.

Fattening Cattle on Home-Grown Feeds

Condensed from The Hereford Journal

John K. Riggs

A combination of unusual circumstances is forcing important changes upon Texas agriculture. The loss of foreign markets for cotton has turned increasing numbers of farmers from cotton production to livestock production and feeding. Meanwhile, the frequent occurrence of drouth since 1930 has turned cattlemen and farmers alike to thinking more and more in terms of supplemental feeding of livestock on the range and of reserve feed supplies on both range and farm.

Every section of the country is confronted with the problem of marketing its particular crops if it is to prosper. In West Texas the limited rainfall makes the production of grain uncertain, yet at the same time is adequate in most years to produce abundant crops of silage and fodder. With sorghums as the main feed crop in this section and with only about 60,000,000 bushels of sorghum grain produced in Texas as compared to from 200,000,000 to 400,000,000 bushels of corn produced annually in Iowa, it is obvious that our problem is not one of marketing grain but of marketing rough feeds.

"A Means of Marketing Crops"

Livestock production in any region is a means of marketing the crops of that region, and one of the biggest mistakes made in West Texas livestock feeding was in adopting feeding practices which had proved to be successful elsewhere instead of developing a program suited to the region. Research and experience have been excellent teachers, however, and the farmers of this section are just beginning to realize fully the merits of their feed crops, climate and markets for the production of meat animals.

In the past it was commonly believed that the sorghum roughages and sorghum grains were inferior to crops of other sections as livestock feeds, and there is still some prejudice which is being rapidly overcome.

Feeding experiments comparing grain sorghum with corn show that for all practical purposes the two are equal for fattening cattle and sheep. The sorghum grains and roughages, supplemented by cottonseed meal, will produce choice cattle in 160 to 180 days which will compete with similar cattle fed corn.

The simple fact that our feeds

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will produce market-topping cattle is not enough, however, to make cattle feeding a success. One thing which we need to know more about is how to realize the greatest returns from our feeds. Without an eye to the economics of the program our venture into farm feeding of livestock is doomed to end in failure. Proper management is the answer to this question, and it is up to every individual feeder to manage the details of his operations to avoid all preventable losses.

A most important consideration in livestock production is to first make maximum use of the native grass and temporary pastures. It is here that the most economic l gains are made, and since approximately 70 percent of Texas is still in grass we should make certain that we market it to advantage without overgrazing so that future returns will be decreased. Good range and pasture management pays dividends, and only after optimum returns are realized from that source is there justification for going into drylot feeding.

Three Alternative Drylot Methods

There are three alternative methods for a cattle feeder to follow in drylot feeding. He may feed rations high in roughage and low in concentrates, high in concentrates and low in roughage, or he may strike a happy medium and feed only moderate amounts of each. Which one he follows will depend largely upon the feed supply in his section in any one year.

A feeding program for this section must be centered around silage or fodder as the main part of the ration, supplemented by cottonseed meal, or cottonseed, and grain when it is available at a price at which it can be fed profitably. This means that a relatively long time will be required to attain good finish on our cattle.

In experiments conducted at Substation No. 7 (Spur) of the Texas Agricultural Experiment Station, sumac silage proved to be equally, if not more, as desirable as the source of roughage in fattening rations as ground sumac fodder, and could be fed at a much lower cost per acre of feed. The trench silo has proven to be economical and practical for storing the sorghum roughages.

Of three amounts, 4, 5½ and 7 pounds, of cottonseed meal fed per head daily with all of the sumac silage the cattle would eat, 5½ pounds gave the greatest net returns for three consecutive years in fattening yearling steers. Steers of 600 to 700 pounds initial weight can be fattened on rations of this kind without the use of grain in about 200 days. This method of feeding affords a means of marketing large amounts of roughage per head and has definite possibilities for profit when grains are scarce and

high in price and silage is abundant and cheap. It has the disadvantage to the feeder of producing only moderate gains, because it is impossible for cattle to consume sufficient silage to secure the nutrients required for making high gains, particularly when the wetter types of silage are fed. Low gains in drylot feeding are accompanied by high cost of gain unless the feeds are very low in price.

It is this latter consideration which makes the method particularly applicable to West Texas conditions where there is virtually no market for rough feeds except through cattle and sheep. There is no question that grain added to a ration of silage and cottonseed meal will increase the amount of finish and decrease the length of time in fattening cattle, but the important point is that such a ration reduces to a minimum the "in-and-out" element of livestock feeding in this section.

In years when only limited amounts of grain are produced the question arises as to the best method of utilizing it. During the fall of 1938 an experiment was designed to study the value of adding a limited amount of ground milo heads to a ration of sumac silage and cottonseed meal when the milo was fed (a) during the entire feeding period and (b) only during the last half of the feeding period. Three lots of 700-pound SMS steers were fed the following rations for a period of 200 days:

Lot 1. Sumac silage, full feed; cottonseed meal, 5.5 pounds.

Lot 2. Sumac silage, full feed; cottonseed meal, 5.5 pounds; 8 pounds ground milo heads during the last half of the feeding period.

Lot 3. Sumac silage, full feed; cottonseed meal, 5.5 pounds; 4 pounds ground milo heads during the entire feeding period.

The addition of 4 pounds of ground milo heads daily to the ration of silage and cottonseed meal for the entire feeding period increased the amount of finish but did not increase the gain. Lot 3, fed milo heads, consumed an average of 10.6 pounds less silage per head than Lot 1, 1 pound of milo heads replacing 2.77 pounds of silage in the daily ration. The addition of 8 pounds of ground milo heads during the last half of the feeding period slightly increased both gain and finish. These cattle also made slightly greater gain than lot 3 which was fed 4 pounds during the entire feeding period.

Lot 2 made less gain during the first half but considerably more during the last half than Lot 3. Thus, with a slight difference in gain favoring Lot 2 and an equal difference in finish favoring Lot 3, it is not possible to advise, on the basis of this one feeding trial, whether or not feeding a limited amount of grain should be de-

ferred to the last half of the feeding period. Deferred feeding of grain is considered sound practice, however, if large enough amounts of feed are fed.

With younger cattle than yearlings one cannot expect to use such large proportions of roughage, since their digestive systems are not developed sufficiently to handle it. When calves are being fed, some grain should be included in the ration for best results, although they may be wintered very satisfactorily on silage or fodder supplemented by cottonseed meal or cake.

It is not uncommon, though somewhat infrequent, for West Texas to produce good grain crops. At such times it is not always feasible to attempt to fatten cattle on high roughage rations. Such was the case in the fall of 1938. With a supply of low-priced milo heads and silage and with cottonseed meal relatively high in price, questions again occurred in regard to the amounts of cottonseed meal which should be fed to fattening steers. Three lots of 800-pound steers were fed none, 2.5 and 5.0 pounds of cottonseed meal per head daily in addition to a full feed of ground milo heads and silage. In this feeding trial the mid-amount of cottonseed meal (2.5 pounds) was the most satisfactory amount to feed, for it produced a very satisfactory gain at low cost, and the steers attained high finish in 144 days. The cattle fed no cottonseed meal made satisfactory gains at low cost but lacked enough in finish and appearance of the hair that they sold for 78 cents per hundred less than the other cattle. The larger amount of meal (5 pounds) produced only slightly greater gains than 2.5 pounds and at greater cost.

Vitamin A Deficiency in West Texas

For a long time after the discovery of vitamins and the subsequent development of information pertaining to mineral metabolism, the livestock industry tended to consider these findings largely as technical matter of little or no practical importance. Evidence in recent years has shown, however, that certain troubles of very great economic importance which occur in livestock, can be explained only through a knowledge of the part which minerals and vitamins play in maintaining the health and well-being of farm animals.

The inadequacy of protein and energy values for evaluating feedstuffs is clearly demonstrated by our failure to devote much study to roughages until comparatively recent years. Concentrate feeds were stressed because of their protein or energy content without full realization that many of them are somewhat deficient in minerals and that most of them have a very low vitamin A potency.

Meanwhile, the discovery that carotene is the precursor or mother-substance of vitamin A and is practically synonymous with bright green color in plants, together with the development of our knowledge regarding the role of vitamin A in the nutrition of animals, has given us a new conception of quality in roughages.

Studying Carotene Requirements

For the past six years we have been studying the carotene requirements of cattle at the Spur station. We have found that the condition of so-called cottonseed poisoning in cattle is caused primarily by the vitamin A deficiency of rations which have commonly been compounded from cottonseed meal and cottonseed hulls. Furthermore, we have learned that vitamin A deficiency will occur on any ration low in carotene, and have produced the same condition which occurs in cattle fed exclusively on meal and hulls by feeding a balanced ration of cottonseed meal, ground milo heads and sorghum fodders.

In some cases the deficiency has occurred even when sorghum silage replaced fodder as the roughage portion of the ration. In other words, our standard West Texas cattle fattening rations are dangerously low in carotene, and something must be done to supplement them when cattle are to be fed in drylot for periods in excess of 60 to 100 days. The length of time required for the deficiency to become manifest depends upon the age of the animals, the amount of green forage on the pasture or range from which they come, and the degree of carotene deficiency of the ration they are fed.

Younger animals require less time to become affected than older animals, and cattle which have had access to an abundance of green forage require a longer time than those which have run on dry range for long periods. Likewise, cattle which are fed cottonseed hulls or sorghum fodders of poor quality as roughage will require less time than those which receive fodder or silage of good quality, that is, high in carotene content.

Alfalfa a Satisfactory Source

Unfortunately, under average conditions, there will be a great deal of roughage in this section which will have low carotene content, and as long as cottonseed hulls form the sole roughage in any ration it will be necessary to supply vitamin A through some other medium. One or two pounds of good quality leafy alfalfa hay per head daily is ample to supply the carotene needed by fattening cattle, and although there are other sources of the vitamin, such as cod liver oil and various carotene preparations, this will probably prove to be the most satisfactory source in the majority of cases.

It is indeed unwise to make

sweeping statements regarding the vitamin A potency of roughages, because it is an unstable factor which is greatly affected by the conditions surrounding harvest, processing and storage of the feeds. Excessive weathering can cause the loss of virtually all of the vitamin A potency in hays and fodders, and, therefore, the value of every different crop varies according to the degree of care and management exercised in handling.

Fertile Eggs Identified after Day's Incubation

FERTILE and infertile hens' eggs can be identified with a high degree of accuracy after the eggs have been incubated from 14 to 20 hours, according to findings by M. W. Olsen and Dr. C. W. Knox, of the Bureau of Animal Industry at the National Agricultural Research Center, Beltsville, Md.

The method of determining fertile and infertile eggs is relatively simple and may be done by the average hatcheryman after a few hours' practice. All the equipment needed is an ordinary egg candler with a 75 watt bulb. However, a daylight bulb or a blue-green bulb or blue eyeglasses aid in seeing the embryo and make identification somewhat more accurate.

The embryos that can be seen at these ages contain no blood, cover an area on the yolk about the size of a dime, and appear before the candler as a small spot. This effect is caused by a slight bulge of the embryo on the surface of the yolk. Such eggs are known as "heated eggs" in commercial candling. In the infertile eggs no developement can be seen.

Some embryos develop faster than others and some are farther developed than others when they are placed in the incubator. Some embryos are developed enough in fresh eggs to tell fertility but the investigators have found, after candling and then breaking over 4,000 eggs to test the accuracy of their identification, that most eggs take 12 hours or more of incubation before the two classes can be identified with fair accuracy. They were able to identify accurately 88.2 per cent of the embryos at 12 hours, 92.1 per cent at 14 hours, 97.6 per cent at 16 hours, and 97.1 per cent at 18 hours.

—*New England Poultryman*

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Encouraging Trees to Root Deeply

Condensed from New Jersey Farm and Garden

William H. Martin

FEW years pass without a prolonged dry period at some time during the growing season. This creates a serious problem in many orchards, where tree roots do not penetrate deep enough to obtain adequate moisture under such conditions. It has long been felt that this condition is traceable in large measure to conditions in the sub-soil which are unfavorable to root development. Excessive acidity is one of the most common of these unfavorable conditions.

That this condition can be remedied, even in an established apple orchard, is shown by results just reported by the horticultural department of the New Jersey Experiment Station. The experiment was started ten years ago in an orchard where the trees had not been making satisfactory growth. Examination of the soil revealed that it was extremely acid (pH 4.6) from the surface to a depth of four feet.

In the spring of 1930, this orchard was given an application of ground oyster shells at the rate of two tons to the acre. Since that time it has received two and one-half tons of dolomitic limestone per acre in three applications, making a total of four and one-half tons of lime to the acre during the ten-year period. The orchard formerly received nitrogen only, with occasional applications of a complete fertilizer. Since 1929, it has had an application of complete fertilizer annually, and several crops of sweet clover have been grown.

As might be expected, the surface soil showed a rapid decrease in acidity after the first application of lime, but the reaction of the subsoil changed more slowly. The pH values finally increased, however, to between 6.5 and 6.7 last year.

Root systems of representative trees were examined in 1937 and again this summer. Three years ago they had penetrated only to a depth of twenty-two to twenty-six inches; this year they had reached from forty-two to forty-eight inches below the surface. It is estimated that this additional penetration permits each tree to tap a moisture reservoir with a capacity of one ton of water more than was available to it in 1937. The trees are now making good growth and both yield and quality of the fruit will unquestionably be improved.

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FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit — By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Poisonous Plants of the United States — By Walter Conrad Muenscher, Prof. Botany, Cornell. Macmillan Company. $3.50.
(See Farmers Digest, November, 1940)

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst.to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

For the convenience of our readers, books listed may be purchased through this Department. Address C. Leavitt Dyer, Farmers Digest, Ambler, Pa.

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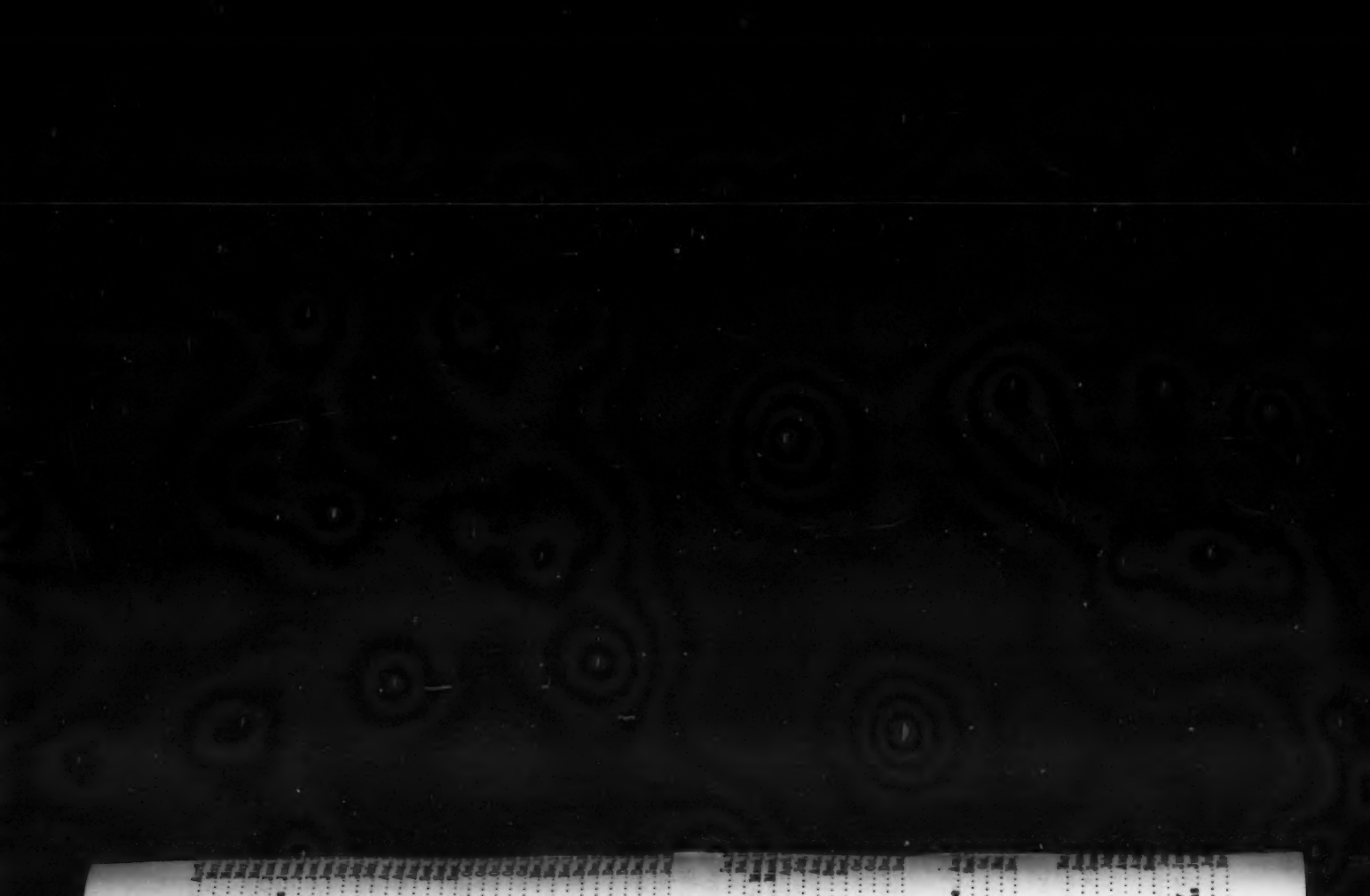

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COMMENTS

"Your publication has been brought to my attention, and I find it a splendid compilation of the best farm articles."—*New York*

"I want you to know that I am receiving a liberal agricultural education from your Farmers Digest."—*Pennsylvania*

"I enjoy your publication and wish every farmer in the state could read the Digest."—*North Carolina*

"Your magazine meets the long-felt need of farmers and busy agricultural workers like myself."—*Arkansas*

"We feel that your magazine has merit in the teaching of agriculture, and we would like our teachers to become familiar with it."—*California*

"I received my first copy of the Farmers Digest today, and I have missed a lot by not knowing that it was published. Will you please advise me if you can supply back numbers."—*Ohio*

"We certainly have been enjoying the Farmers Digest at our school and we would like to complete our files."—*California*

"The boys have a waiting list to read the Farmers Digest."—*Ohio*

"One of your subscribers recently loaned me a copy of the Farmers Digest. I enjoyed the contents so much that I am entering my name on your subscription list."—*Nebraska*

"I consider the Farmers Digest the best all-round farm magazine published in the United States today."—*North Carolina*

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